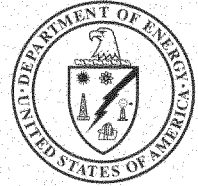


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Idaho Operations Office

Field Sampling Plan for the Central Facilities Area-04 Pond Remedial Action



Idaho National Engineering and Environmental Laboratory

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February 2003

**Prepared for the
U.S. Department of Energy
Idaho Operations Office**

ABSTRACT

This Field Sampling Plan outlines the collection and analysis of samples in support of the Central Facilities Area-04 mercury pond remedial action. The *Final Comprehensive Record of Decision for Central Facilities Area Operable Unit 4-13* defines the selected remedy for the pond as excavation, treatment by stabilization, and disposal of the mercury-contaminated soil at the Idaho National Engineering and Environmental Laboratory. The sampling effort supports five purposes. First, minimal sampling will be performed prior to remediation to further define the horizontal and vertical extent of contamination in those areas where data gaps have been identified from previous sampling efforts. Second, sampling in these newly defined areas is needed to determine the waste disposition pathway for the soil to be excavated. Third, the primary purpose of this sampling effort is to provide for the confirmation sampling of the pond to ensure that the final remediation goals for mercury have been met. Fourth, soil remaining in the basalt fractures, where soil has been removed down to the basalt, is to be sampled to assess the residual risk associated with mercury contamination associated with the soil. Fifth, any bottles of calcine found in the area will be sampled and analyzed for waste disposition characterization. There is no final remediation goal associated with the soil contaminated with asbestos-containing material.

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ACRONYMS

ARAR	applicable or relevant and appropriate requirement
CEL	Chemical Engineering Laboratory
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFA	Central Facilities Area
CFR	Code of Federal Regulations
CWSU	CERCLA waste storage unit
DOE-ID	U.S. Department of Energy Idaho Operations Office
DQO	data quality objective
DR	decision rule
DS	decision statement
EPA	U. S. Environmental Protection Agency
ER	environmental restoration
FSP	Field Sampling Plan
FTL	field team leader
GDE	guide
GFPC	gas flow proportional counting
HASP	Health and Safety Plan
HDPE	high-density polyethylene
IAG	interface agreement
ICDF	INEEL CERCLA Disposal Facility
ID	identification
INEEL	Idaho National Engineering and Environmental Laboratory
MCP	management control procedure
OU	operable unit
PSQ	principal study question

QA	quality assurance
QA/QC	quality assurance/quality control
QAPjP	Quality Assurance Project Plan
QC	quality control
RCRA	Resource Conservation and Recovery Act
RI/FS	remedial investigation/feasibility study
ROD	Record of Decision
SAP	Sampling and Analysis Plan
TCLP	toxicity characteristic leaching procedure
TPR	technical procedure
UCL	upper confidence level
WAC	waste acceptance criteria
WAG	waste area group
WGS	Waste Generator Services

Field Sampling Plan for the Central Facilities Area-04 Pond Remedial Action

1. OVERVIEW

This Field Sampling Plan (FSP) describes the sampling activities designed to ensure that final remediation goals have been met for the Central Facilities Area (CFA) mercury pond (CFA-04), which is located within Waste Area Group (WAG) 4 at the Idaho National Engineering and Environmental Laboratory (INEEL). In addition, this FSP and the Quality Assurance Project Plan (QAPjP) compose the Sampling and Analysis Plan (SAP).

These plans have been prepared pursuant to the “National Oil and Hazardous Substances Pollution Contingency Plan” (40 CFR 300) in accordance with guidance from the U.S. Environmental Protection Agency (EPA) on the preparation of SAPs and in accordance with MCP-9439, “Preparation for Environmental Sampling Activities at the INEEL.” This FSP describes the field sampling activities that will be performed, while the QAPjP details the processes and programs that will be used to ensure that the data generated are suitable for their intended uses. In addition, this FSP develops the data quality objectives (DQOs) that the collection of samples will be based on. The governing QAPjP for this sampling effort will be the *Quality Assurance Project Plan for Waste Area Groups 1, 2, 3, 4, 5, 6, 7, 10, and Inactive Sites* (DOE-ID 2002a). Work control processes will follow formal practices in accordance with the communicated agreement between the appropriate site area director and the Environmental Restoration (ER) WAG 4 project manager or designee.

1.1 Field Sampling Plan and Other Documentation

This FSP serves five purposes. First, minimal sampling is required prior to remediation to further define the horizontal and vertical extent of contamination in those areas where data gaps have been identified from previous sampling efforts. Second, these newly identified areas of excavation will be sampled to determine the disposition pathway for the waste soil. Third, the primary purpose of this FSP is to guide the collection and analysis of samples required to ensure that the final remediation goals, as defined in the *Final Comprehensive Record of Decision for Central Facilities Area Operable Unit 4-13* (DOE-ID 2000a; herein after referred to as the Record of Decision [ROD]), have been met. The fourth purpose is to sample the soil remaining in the basalt fractures in those areas where soil has been removed down to basalt to allow for an assessment of the residual risk associated with the mercury contamination levels. Fifth, any bottles of calcine found during the remedial action will need to be characterized for disposal. The remedial activities are defined in the *Waste Area Group 4 Remedial Design/Remedial Action Work Plan, CFA-04 Pond Mercury-Contaminated Soils, Operable Unit 4-13* (DOE-ID 2003a).

In addition, the *Health and Safety Plan for the CFA-04 Mercury Pond Sampling and Remedial Action* (INEEL 2002) has been prepared for this project and covers the activities associated with the remediation of the site, including the sampling being performed in support of the remedial action. The “Interface Agreement between the Environmental Restoration Program, Waste Area Groups 4, 5, 10, and D&D&D and the Central Facilities Area” (IAG-156) addresses activities related to the WAG 4 ROD (DOE-ID 2000a) and the remedial design/remedial action as carried out within the CFA under the purview of the CFA site area director.

1.2 Project Organization and Responsibility

The organizational structure for this work reflects the resources and expertise required to plan and perform the work, while minimizing risks to worker health and safety. The Health and Safety Plan (HASP) (INEEL 2002) provides the job titles of the individuals who will be filling the key managerial roles and lines of responsibility and communication.

2. SITE BACKGROUND

Section 2 describes the site, nature and extent of contamination, and the project.

2.1 Site Description

The INEEL is a government-owned contractor-operated facility managed by the U.S. Department of Energy Idaho Operations Office (DOE-ID) and is located 51 km (32 mi) west of Idaho Falls, Idaho (see Figure 1). This facility occupies 2,305 km² (890 mi²) of the northeastern portion of the Eastern Snake River Plain and encompasses portions of five Idaho counties: (1) Butte, (2) Jefferson, (3) Bonneville, (4) Clark, and (5) Bingham.

The CFA has been used since 1949 to house many of the support services for all of the operations at the INEEL. These support services include laboratories, security operations, fire protection, medical facilities, communication systems, warehouses, a cafeteria, vehicle and equipment pools, the bus system, and laundry facilities. The *Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory* (DOE-ID 1991) identified 52 potential release sites at CFA, which were designated as WAG 4. The types of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites at WAG 4 include landfills, underground storage tanks, aboveground storage tanks, dry wells, disposal ponds, soil contamination sites, and a sewage plant. Each of these sites was placed into one of 13 operable units (OUs) within the WAG, based on similarity of contaminants, environmental release pathways, or investigations.

The CFA-04 mercury pond is a shallow, unlined surface depression that originally was a borrow pit for construction activities at CFA (see Figure 2). The pond is approximately 46 × 152 m (150 × 500 ft) wide and roughly 2 to 2.4 m (7 to 8 ft) deep. Basalt outcrops are present within, and immediately adjacent to, the pond. It received laboratory waste from the Chemical Engineering Laboratory (CEL) in the CFA-674 building between 1953 and 1969. The CEL was used to conduct calcine experiments on simulated nuclear waste. The calcining process later was used on actual nuclear waste at the INEEL to change the waste from a liquid to a solid, thereby reducing the amount of overall waste. The CEL experiments used mercury to dissolve simulated aluminum fuel cladding, as well as radioisotope tracers in the calcining process. The primary waste streams discharged to the mercury pond from the CEL included approximately 76.5 m³ (100 yd³) of mercury-contaminated calcine that contained low-level radioactive waste and liquid effluent from the laboratory experiments. In addition, there is approximately 382 m³ (500 yd³) of rubble consisting of laboratory bottles, asphalt and asbestos roofing materials, reinforced concrete, and construction and demolition debris. The pond also received run-off from the CFA site periodically between 1953 and 1995.

2.2 Nature and Extent of Contamination

The CFA-04 mercury pond was identified as a Track 2 investigation site in the Federal Facility Agreement and Consent Order (DOE-ID 1991). In 1994, visual inspections revealed the presence of calcine on the bermed areas around the periphery of the pond. After surface and subsurface soil data collection from the calcine and the pond berm in early and mid-1994, a time-critical removal action in September 1994 excavated approximately 218 m³ (285 yd³) of calcine and calcine-contaminated soil and a small amount of asbestos-containing material from the bermed area. Subsequently, the asbestos-containing material has been determined to be nonfriable. The soil was remediated at a portable retort set up northeast of the pond. Verification soil sampling conducted after the removal action showed that, with the exception of one location having a mercury concentration of 233 mg/kg, the bermed areas had residual mercury concentrations less than the final remediation goal of 8.4 mg/kg (DOE-ID 2000b).

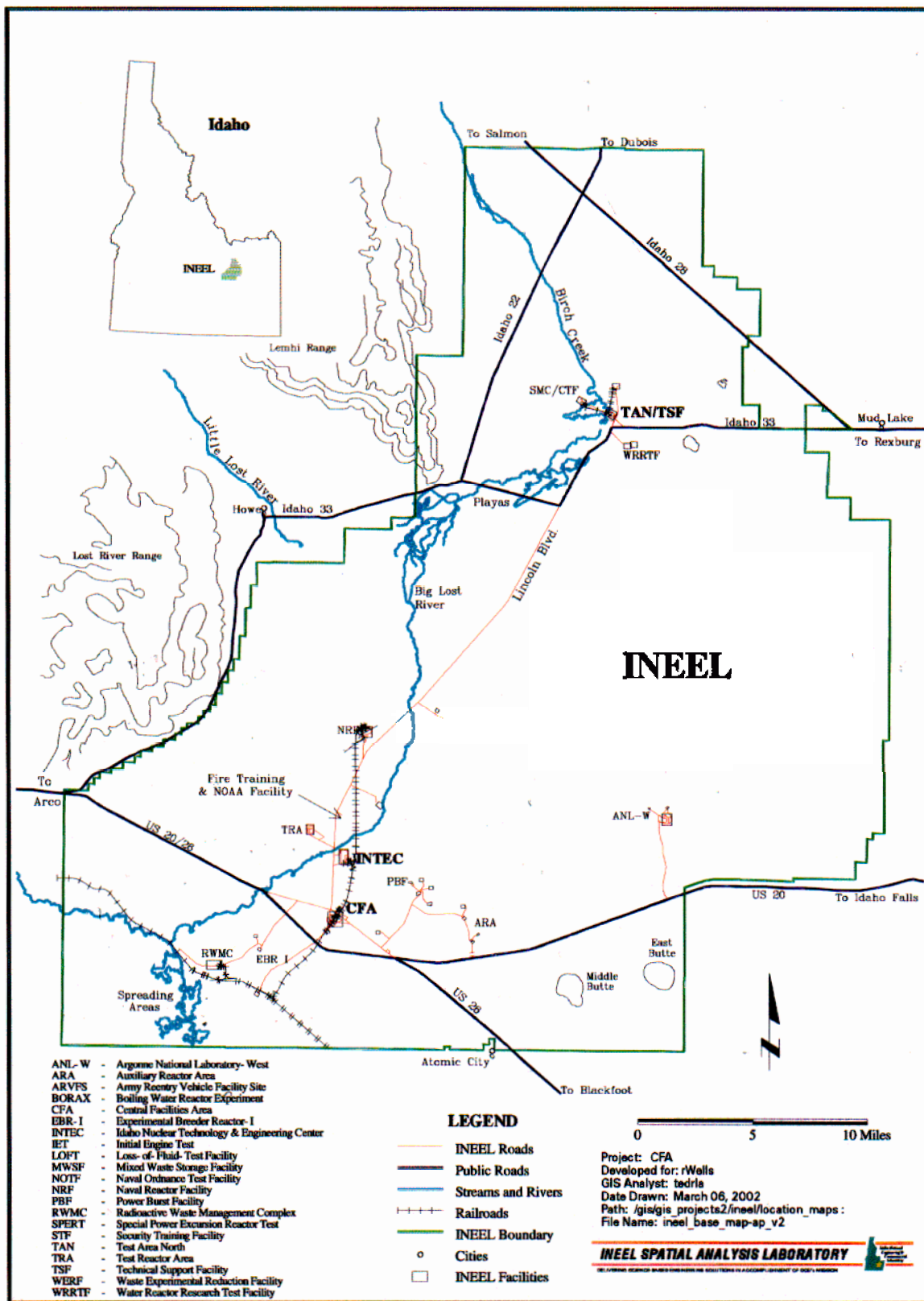


Figure 1. Map of the Idaho National Engineering and Environmental Laboratory.

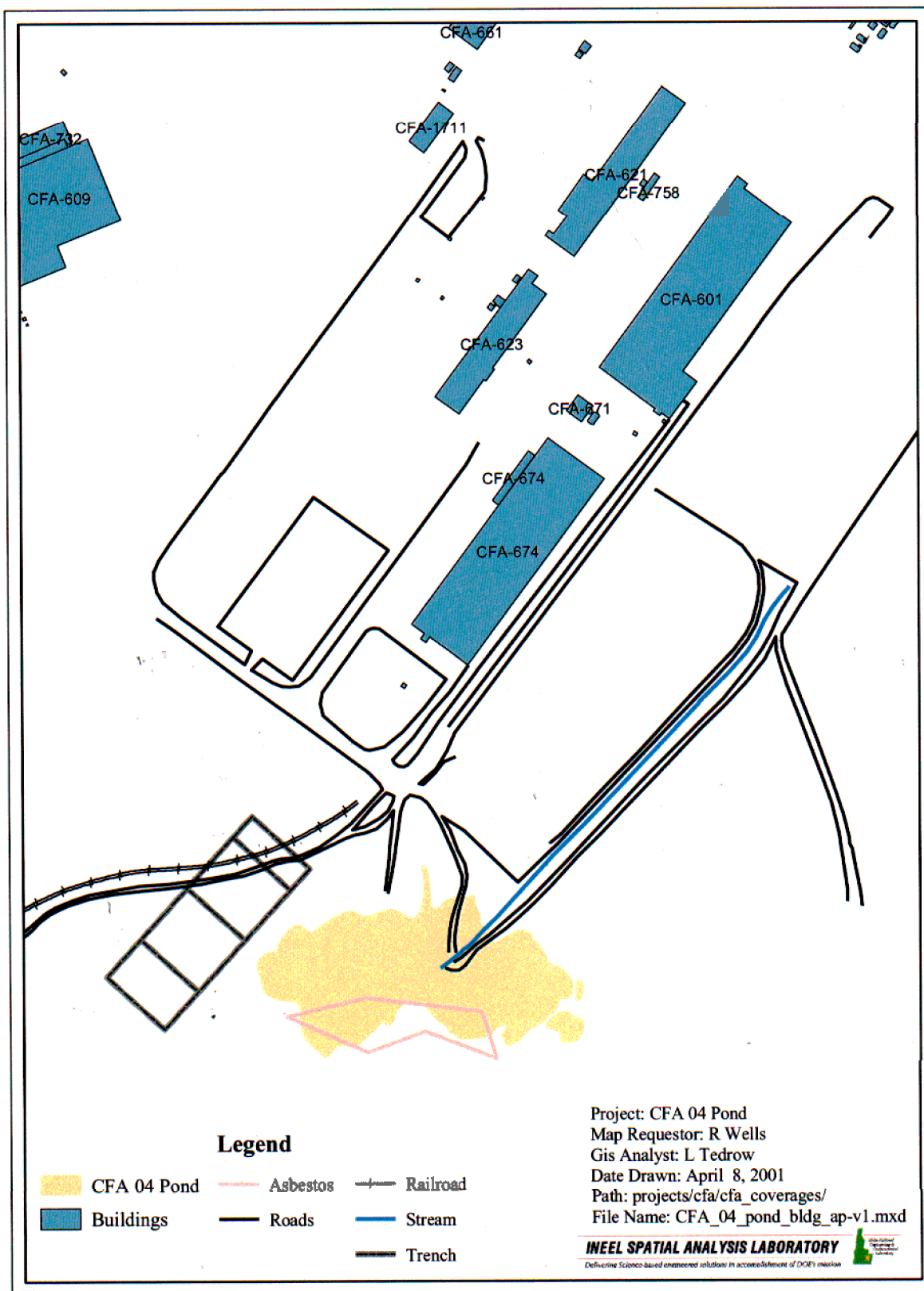


Figure 2. Location of the Central Facilities Area-04 pond.

The ROD (DOE-ID 2000a) originally established a final remediation goal of 0.5 mg/kg for mercury contamination at CFA-04. This was an ecological goal based on 10 times the average background concentration for composite samples. It was determined that a reevaluation of the final remediation goal for mercury was warranted for both human and ecological receptors after new information became available from EPA sources. Based on this new information, hazard quotients were recalculated for the existing concentration of mercury at the CFA-04 mercury pond. For the future residential exposure scenario, the recalculated hazard quotient is 7.56, as compared to 80 from the ROD (DOE-ID 2000a). For the ecological risk assessment, the recalculated values are <1 to 210 as compared to <1 to 30,000 from the ROD (DOE-ID 2000a). Based on this new information, the recalculated remediation goals for ecological and human health risk are 8.4 mg/kg and 9.4 mg/kg, respectively. The recalculated remediation goals for both human health and ecological receptors are consistent with the remedial action objectives for the CFA-04 mercury pond. This information is presented in the *Explanation of Significant Differences to the Record of Decision for the Central Facilities Area, Operable Unit 4-13* (DOE-ID 2003b).

During the 1995 Track 2 investigation, additional soil samples were collected from the mercury pond inlet area and a deeper area of the pond near the inlet where laboratory effluent might have collected. The results of the 1994 and 1995 soil investigations revealed that concentrations of the following constituents exceeded background concentrations for the INEEL: aluminum, arsenic, barium, cadmium, calcium, chromium, cobalt, lead, magnesium, mercury, nickel, Cs-137, Pa-234m, Sr-90, Th-234, U-234, U-235, and U-238. Aroclor-1254 also was detected at low levels. Preliminary risk screening indicated that the following constituents detected at the pond posed potential human health risks: aroclor-1254, arsenic, mercury, Cs-137, U-234, U-235, and U-238. The range of detected concentrations of these analytes is presented in Table 1. Based on these data, the site was recommended in the *Preliminary Scoping Track 2 Summary Report for Operable Unit 4-05* (Blackmore, Peatross, and Stepan 1996) for further characterization in the *Comprehensive Remedial Investigation/Feasibility Study for the Central Facilities Area Operable Unit 4-13 at the Idaho National Engineering and Environmental Laboratory* (DOE-ID 2000b).

Table 1. Range of detected concentrations for each analyte.

Analyte	Range of Detected Concentrations
Arsenic	3.1 to 22.4 mg/kg
Mercury	0.12 to 439 mg/kg
Cs-137	0.0742 to 2 pCi/g
U-234	0.651 to 22.6 pCi/g
U-235	0.0225 to 1.6 pCi/g
U-238	0.73 to 35 pCi/g

During 1997 and 1998, additional soil samples were collected for the OU 4-13 Remedial Investigation/Feasibility Study (RI/FS) at four areas along the length of the pipe connecting the CEL to the pond, in the area northeast of the mercury pond known as the windblown area, and from the pond bottom. Data from these investigations confirmed the presence of mercury in these areas at concentrations up to 439 mg/kg (DOE-ID 1992). Four of the 88 samples exceeded the mercury Resource Conservation and Recovery Act (RCRA) characteristic hazardous waste level of 0.2 mg/L. Three of the four samples were in close proximity to one another in the pond, and the fourth was an isolated occurrence in the windblown area and was eliminated. A contour line was drawn around the three closely spaced samples and the size of the area of contamination was estimated. The depth of the soil in the pond conservatively was estimated to be 2.4 m (8 ft) in the pond bottom and 0.15 m (0.5 ft) in the windblown area, indicating that approximately 612 m³ (800 yd³) of soil is potentially characteristic waste in accordance with the RCRA and is subject to land disposal restrictions upon excavation.

The contaminants of potential concern identified above were evaluated during the baseline risk assessment as presented in the RI/FS (DOE-ID 2000b). As a result of the risk assessment, the only contaminant that poses an unacceptable risk to human health and the environment is mercury. Mercury-contaminated soil is present in the pond bottom, around the pond periphery in the berms, along the pipe connecting the CEL to the pond, and in the area northeast of the pond (as a result of windblown contamination). This contamination encompasses an area approximately 91×183 m (300×600 ft). The OU 4-13 RI/FS conservatively estimated the volume of mercury-contaminated soil to be approximately $6,338 \text{ m}^3$ ($8,290 \text{ yd}^3$), based on the dimensions of the pond bottoms, windblown area, and pipeline at depths of 2.4 m (8 ft), 0.15 m (0.5 ft), and 1.8 m (6 ft), respectively. This volume was calculated using the extent of contamination based on the original final remediation goal of 0.50 mg/kg for total mercury, as stated in the ROD (DOE-ID 2000a). The final volume might differ based on the revised final remediation goal of 8.4 mg/kg and actual conditions encountered in the field.

2.3 Project Description

During the summer of 2002, sampling was performed within the contours of the pond and at selected areas outside the pond that were determined to contain higher mercury concentrations based on historical analytical data. The data obtained were used to further refine the vertical extent of contamination to provide better direction for the remediation excavation effort. The collection of samples also served to determine the final treatment or disposal options for the contaminated soil excavated from the pond and to determine whether the assumptions used in calculating the final remediation goals were valid. These data are summarized in Appendix D of the Remedial Design/Remedial Action Work Plan (DOE-ID 2003).

As previously stated, sampling in support of the CFA-04 remedial action will serve to fill data gaps identified since the previous sampling effort and to ensure that the final remediation goal for the CFA-04 mercury pond has been met. As stated in Section 2.2, the final remediation goal for the pond is 8.4 mg/kg. This goal is based on the presence of mercury posing an unacceptable ecological risk. Mercury also poses an unacceptable human health risk at a concentration of 9.4 mg/kg, but the more conservative concentration of 8.4 mg/kg will be used as the final remediation goal. Samples will be collected throughout the remediated area to confirm that concentrations of mercury remaining in the vicinity of the pond are at or below 8.4 mg/kg. The asbestos-containing material at the CFA-04 pond area has been determined to be nonfriable, as indicated in Appendix H of the Remedial Design/Remedial Action Work Plan (DOE-ID 2003).

3. SAMPLING OBJECTIVES

Data needs and DQOs for conducting the proposed sampling at CFA-04 are defined in the following subsections. Data needs have been determined through the evaluation of existing data and the projection of data requirements for analysis of samples collected during the CFA-04 prerediation sampling effort.

3.1 Data Quality Objectives

The DQOs were developed following the seven-step process outlined in *Guidance for the Data Quality Objectives Process* (EPA 1994). The DQOs in these subsections provide the basis for the sampling to be performed. Section 4 provides a summary of the sampling locations, frequencies, and analytical requirements. The following team members contributed to this DQO process:

- Robert E. James WAG 4 Project Manager
- Christine M. Hiaring WAG 4 Deputy Project Manager
- Douglas H. Preussner WAG 4 Project Engineer
- Deborah W. Wagoner WAG 4 Technical Task Leader
- Richard P. Wells Advisory Scientist.

3.1.1 Problem Statement

The objective of DQO Step 1 is to use relevant information to clearly and concisely state the problem to be resolved. As previously discussed, there are five basic parts to the problem. The problem statements associated with this DQO process step are:

- Problem Statement 1—Extent of Contamination: Define the horizontal and vertical extent of contamination in those areas where data gaps have been identified since the previous sampling effort
- Problem Statement 2—Disposition Pathways: Obtain data necessary to determine the final treatment or disposal of newly identified mercury-contaminated soil to be excavated from the CFA-04 pond
- Problem Statement 3—Final Remediation Goal: Confirm that the final remediation goal of 8.4 mg/kg for mercury has been met for the CFA-04 pond
- Problem Statement 4—Residual Risk: Determine the mercury concentrations in soil remaining in fractures in the basalt to assess the overall risk remaining at the CFA-04 site
- Problem Statement 5—Calcine Characterization: Determine the contaminant concentrations in bottles of calcine found at the site to determine the appropriate disposal path.

3.1.2 Decision Identification

The goal of DQO Step 2 is to define the questions that the study will attempt to resolve and to identify the alternative actions that may be taken based on the outcome of the study. Alternative actions are those actions resulting from the resolution of the stated principal study questions. The types of

alternative actions considered depend on the answers to the principal study questions. The principal study questions and their corresponding alternative actions then will be joined to form decision statements (DSs). The principal study questions, alternative actions, and resulting DSs for CFA-04 remedial action sampling are provided in Table 2.

3.1.3 Identify Inputs to the Decision

The purpose of DQO Step 3 is to identify the type of data needed to resolve each of the DSs identified in DQO Step 2. These data could exist already or could be derived from computational, surveying, or sampling and analysis methods. Analytical performance requirements (e.g., practical quantitation limits, precision, and accuracy) also are provided in this step for any new data that will be collected.

Table 2. Summary of data quality objective Step 2 information.

Alternative Action	Error Associated with Incorrect Action	Consequences of Error	Severity of Consequences
PSQ #1—What is the horizontal and vertical extent of contamination in those areas of the pond where data gaps have been identified and the mercury concentrations possibly exceed the final remediation goal of 8.4 mg/kg for mercury?			
The horizontal and vertical extent of contamination is properly defined, delineating the extent of mercury contamination exceeding the remediation goal of 8.4 mg/kg.	Extent of contamination erroneously is determined to be smaller than it is.	Contaminated soil, exceeding the remediation goal of 8.4 mg/kg, lie outside the defined boundaries with soil exceeding the remediation goal remaining at the site following excavation.	Moderate
The horizontal and vertical extent of contamination is not properly defined, delineating the extent of mercury contamination exceeding the remediation goal of 8.4 mg/kg.	Extent of contamination erroneously is determined to be larger than it is.	Contaminated soil, exceeding the remediation goal of 8.4 mg/kg, is well within the defined boundaries with soil not exceeding the remediation goals being excavated for disposal.	Low
DS #1—Determine the horizontal and vertical extent of contamination in those areas of the pond where data gaps have been identified and where the mercury concentrations possibly exceed the final remediation goal of 8.4 mg/kg for mercury.			
PSQ #2a—Does the newly identified mercury-contaminated soil exceed the toxicity characteristic leaching procedure limits for mercury, chromium, or silver?			
Soil to be excavated is identified as being characteristic for mercury, chromium, or silver and stabilized for disposal in the ICDF.	Soil to be excavated erroneously is identified as being characteristic.	Soil is stabilized unnecessarily prior to disposal.	Moderate

Table 2. (continued).

Alternative Action	Error Associated with Incorrect Action	Consequences of Error	Severity of Consequences
Soil to be excavated is not identified as being characteristic for mercury, chromium, or silver and is direct-disposed of in the ICDF.	Soil to be excavated erroneously is identified as not being characteristic.	Soil is disposed of inappropriately in the ICDF.	High
DS #2a—Based upon the analytical data, determine whether any of the newly identified mercury-contaminated soil is RCRA characteristic for the key contaminants.			
PSQ #2b—Does the newly identified mercury-contaminated soil contain elevated concentrations of radionuclides?			
Soil to be excavated is identified as containing elevated concentrations of radionuclides.	Soil to be excavated erroneously is identified as containing elevated concentrations of radionuclides.	Excavated soil that could be disposed of in the CFA landfill is disposed of in the ICDF, leading to unnecessary use of space at the ICDF.	Low
Soil to be excavated is identified as not containing elevated concentrations of radionuclides.	Soil to be excavated erroneously is identified as not containing elevated concentrations of radionuclides.	Excavated soil that should be disposed of in the ICDF is disposed of in the CFA landfill.	High
DS #2b—Based upon the analytical data, determine whether any of the newly identified mercury-contaminated soil contains elevated concentrations of radionuclides.			
PSQ #3—Does soil remaining in the CFA-04 pond following remediation meet the final remediation goal of 8.4 mg/kg for mercury?			
The soil remaining in the CFA-04 pond following remediation meets the final remediation goal of 8.4 mg/kg for mercury.	Mercury concentrations erroneously are determined to be less than the final remediation goal.	Contaminated soil, exceeding the remediation goal of 8.4 mg/kg, remains in the pond, posing an unacceptable risk to human health or the environment.	High
The soil remaining in the CFA-04 pond following remediation exceeds the final remediation goal of 8.4 mg/kg for mercury.	Mercury concentrations erroneously are determined to be greater than the final remediation goal.	Contaminated soil, less than the remediation goal of 8.4 mg/kg, is excavated for disposal leading to increased excavation cost and unnecessary use of space in the ICDF.	Low

Table 2. (continued).

Alternative Action	Error Associated with Incorrect Action	Consequences of Error	Severity of Consequences
DS #3—Using SW-846 analytical methodology, confirm that the soil remaining in the CFA-04 pond is less than the final remediation goal of 8.4 mg/kg.			
PSQ #4—Does the soil remaining in the basalt fractures meet the final remediation goal of 8.4 mg/kg for mercury not contributing significantly to the residual risk associated with the CFA-04 site?			
The soil remaining in the basalt fractures following remediation meets the final remediation goal of 8.4 mg/kg for mercury.	Mercury concentrations erroneously are determined to be less than the final remediation goal.	Contaminated soil, exceeding the remediation goal of 8.4 mg/kg, remains in the basalt fractures providing a significant contribution to the residual risk associated with the CFA-04 site.	High
The soil remaining in the basalt fractures following remediation exceeds the final remediation goal of 8.4 mg/kg for mercury.	Mercury concentrations erroneously are determined to be greater than the final remediation goal.	Contaminated soil, less than the remediation goal of 8.4 mg/kg, remains in the basalt fractures resulting in the unnecessary implementation of institutional controls.	Moderate
DS #4—Using SW-846 analytical methodology, determine the mercury concentrations for the soil remaining in the basalt fractures.			
PSQ #5—What is the appropriate disposal path for any bottles of calcine found during the remedial action?			
The contaminants in the calcine meet the waste acceptance criteria for the ICDF or CFA landfill.	Contaminant concentrations erroneously are determined to be less than the waste acceptance criteria for the ICDF or CFA landfill.	Contaminated calcine, exceeding the waste acceptance criteria, is disposed of in the ICDF or CFA landfill.	High
The contaminants in the calcine exceed the waste acceptance criteria for the ICDF or CFA landfill.	Contaminant concentrations erroneously are determined to exceed the waste acceptance criteria for the ICDF or CFA landfill.	Contaminated calcine, less than the waste acceptance criteria for the ICDF or CFA landfill, instead is sent to a more costly treatment and disposal facility.	Moderate
DS #5—Using SW-846 and radiochemical analytical methodology, determine the contaminant concentrations in the bottles of calcine found during the remedial action.			
CFA = Central Facilities Area DS = decision statement ICDF = INEEL CERCLA Disposal Facility PSQ = principal study question RCRA = Resource Conservation and Recovery Act			

3.1.3.1 Information Required to Resolve Decision Statements. Table 3 specifies the information (data) required to resolve each of the DSs identified in Subsection 3.1.2 and identifies whether these data already exist. For the data that are identified as existing, the source references for the data have been provided with a qualitative assessment as to whether the data are of sufficient quality to resolve the corresponding DS. The qualitative assessment of the existing data was based on the evaluation of the corresponding quality control data (e.g., spikes, duplicates, and blanks), detection limits, and data collection methods.

Table 3. Required information and reference sources.

Decision Statement Number	Measurement Variable	Required Data	Do Data Exist? (Yes/No)	Source Reference	Sufficient Quality? (Yes/No)	Additional Information Required? (Yes/No)
1	Mercury concentrations	Field and laboratory measurements of contaminant	Yes	Work Plan Appendix D (DOE-ID 2003)	No	Yes
2a	TCLP metal concentrations	Laboratory measurements of potential contaminants	No	—	No	Yes
2b	Radionuclide concentrations	Laboratory measurements of potential contaminants	No	—	No	Yes
3	Mercury concentrations	Field and laboratory measurements of contaminant	No	—	No	Yes
4	Mercury concentrations	Laboratory measurements of contaminant	No	—	No	Yes
5	Mercury, TCLP metal, and radionuclide concentrations	Laboratory measurements of contaminants	No	—	No	Yes

TCLP = toxicity characteristic leaching procedure

3.1.3.2 Basis for Setting the Action Level. The action level is the threshold value that provides the criterion for choosing between alternative actions. The contaminant of concern is mercury for DSs 1, 3, and 4. The basis for setting the action level is the final remediation goal of 8.4 mg/kg. For DS 2a, the potential contaminants are mercury, chromium, and silver. The basis is the maximum concentration of contaminants for the toxicity characteristic, as defined in 40 CFR 261.24, Table 1. For DS 2b, the potential contaminants are Cs-137, Pa-234m, Sr-90, Th-234, U-234, U-235, and U-238. The bases for setting the action levels for DS 2b are the background concentrations at the INEEL, as found in the *Background Dose Equivalent Rates and Surficial Soil Metal and Radionuclide Concentrations for the Idaho National Engineering Laboratory* (Rood, Harris, and White 1996). For DS 5, the contaminants of concern are total mercury, toxicity characteristic leaching procedure (TCLP) metals, and radionuclides. The basis for setting the radionuclide action levels is the acceptance criteria for the disposal facility, regardless of whether the selected facility is the ICDF, CFA landfill, or an off-Site treatment and disposal facility. For the TCLP metals, the basis is the maximum concentration for the toxicity characteristic, as defined in 40 CFR 261.24. For total mercury, the basis is both the applicable waste acceptance criteria and the 260-mg/kg regulatory level that would drive the treatment to retort. The numerical values for the action levels are provided in DQO Step 5.

3.1.3.3 Computational and Survey/Analytical Methods. Table 4 identifies the DSs where data either do not exist or are of insufficient quality to resolve the DSs. For these DSs, Table 4 presents computational and surveying/sampling methods that could be used to obtain the required data.

Table 4. Information required to resolve the decision statements.

Decision Statement Number	Measurement Variable	Required Data	Computational Methods	Survey/Analytical Methods
1	Mercury	Total mercury concentrations in suspect soil	Compare total mercury concentrations to the final remediation goal.	Field screening and analytical laboratory determination of mercury concentrations in soil
2a	Mercury, chromium, and silver	TCLP metal concentrations in suspect soil	Compare TCLP metal concentrations to the regulatory levels.	Analytical laboratory determination of TCLP metal concentrations in soil
2b	Cs-137, Pa-234m, Sr-90, Th-234, U-234, U-235, and U-238	Radionuclide concentrations in suspect soil	Compare radionuclide concentrations to background levels.	Analytical laboratory determination of radionuclide concentrations in soil
3	Mercury	Total mercury concentrations in the remaining soil	Compare total mercury concentrations to the final remediation goal.	Field screening and analytical laboratory determination of mercury concentrations in remaining soil
4	Mercury	Total mercury concentrations in remaining soil found in the basalt fractures	Compare total mercury concentrations to the final remediation goal.	Analytical laboratory determination of mercury concentrations in remaining soil
5	Mercury, TCLP metals, and radionuclides	Total mercury, TCLP metal, and radionuclide concentrations in calcine found in bottles	Compare contaminant concentrations to the waster acceptance criteria.	Analytical laboratory determination of mercury, TCLP metals, and radionuclide concentrations in calcine found in bottles

TCLP = toxicity characteristic leaching procedure.

3.1.3.4 Analytical Performance Requirements. Table 5 defines the analytical performance requirements for the data that need to be collected to resolve each of the DSs. These performance requirements include practical quantitation limit, precision, and accuracy requirements for the contaminant.

Table 5. Analytical performance requirements.

Decision Statement Number	Analyte List	Survey/ Analytical Method	Preliminary Action Level (mg/kg or pCi/g)	Practical Quantitation Limit (mg/kg or pCi/g)	Precision Requirement	Accuracy Requirement
1	Mercury	Field Analyzer SW-846	8.4	0.05 0.2	± 30%	70–130%
2a	TCLP mercury TCLP chromium TCLP silver	SW-846	0.2 mg/L 5.0 mg/L 5.0 mg/L	0.2 µg/L 10 µg/L 10 µg/L	± 30%	70–130%
2b	Cs-137 Pa-234m Sr-90 Th-234 U-234 U-235 U-238	Gamma Spec. Gamma Spec. GFPC ^a Gamma Spec. Alpha Spec. Alpha Spec. Alpha Spec.	0.44 1.04 ^b 0.26 1.04 ^b 1.03 0.048 ^c 1.04	0.1 d 0.1 d 0.05 0.05 0.05	± 20%	80–120%
3	Mercury	Field Analyzer SW-846	8.4	0.04 0.2	± 30%	70–130%
4	Mercury	SW-846	8.4	0.2	± 30%	70–130%
5	Mercury TCLP metals Gamma Alpha/Beta	SW-846 SW-846 Gamma Spec. Gross alpha/beta	WAC ^e 40 CFR 261.24 WAC ^e WAC ^e	QAPjP	± 30% ± 30% ± 20% ± 20%	70–130% 70–130% 80–120% 80–120%

a. GFPC = gas-flow proportional counting

b. The action level was determined based upon the assumption that Pa-234m and Th-234 would be in secular equilibrium with U-238.

c. The action level was calculated based upon the naturally occurring isotopic ratio of U-235 to U-238 and the average concentration of U-238 in INEEL soil.

d. Based on Cs-137, all other gamma-emitting isotopes have a detection limit commensurate with their photon yield and energy as related to the Cs-137 detection limit.

e. The action levels are dependent on the waste acceptance criteria for the individual treatment or disposal facilities. For mercury, if concentrations exceed 260 mg/kg, the prescribed treatment is retort.

CFR = *Code of Federal Regulations*

INEEL = Idaho National Engineering and Environmental Laboratory

QAPjP = Quality Assurance Project Plan

TCLP = toxicity characteristic leaching procedure

WAC = waste acceptance criteria

3.1.4 Study Boundaries

The primary objective of DQO Step 4 is to identify the population of interest, define the spatial and temporal boundaries that apply to each decision statement, define the scale of decision-making, and identify any practical constraints (hindrances or obstacles) that must be taken into consideration in the sampling design. Implementing this step ensures that the sampling design will result in the collection of data that accurately reflect the true condition of the site under investigation.

3.1.4.1 Geographic Boundaries. Limiting the geographic boundaries of the study area ensures that the investigation does not expand beyond the original scope of the task. This study will focus on the CFA-04 mercury pond at WAG 4. Based on a review of the existing data, the collection of samples from selected sites in the defined area will satisfy DSs 1 and 2 defined for DQOs. For DS 3, the collection of

samples from the remediated areas will satisfy this DS, as defined for the DQO. For DS 4, the collection of samples from fractured basalt where contaminated soil has been removed will satisfy this DS, as defined for the DQO. For DS 5, calcine samples from the bottles will be collected.

3.1.4.2 Temporal Boundaries. The temporal boundary refers to the timeframe that each decision statement applies to (e.g., number of years) and when (e.g., season, time of day, weather conditions) the data optimally should be collected. Temporal boundaries are important when contaminant concentration changes over time are significant. There is no temporal component to the CFA-04 mercury pond remedial action sampling.

3.1.4.3 Scale of Decision-Making. The scale of decision-making is defined by joining the population of interest and the geographic and temporal boundaries of the area under investigation. For the CFA-04 mercury pond remedial action sampling, the scale of decision-making is the same as the geographic boundary defined in Subsection 3.1.4.1.

3.1.4.4 Practical Constraints. Practical constraints could include physical barriers, difficult sample matrices, high-radiation areas, or any other condition that will need to be taken into consideration in the design and scheduling of the sampling program. For the CFA-04 mercury pond remedial action sampling, there are no practical constraints to be considered.

3.1.5 Develop a Decision Rule

The purpose of DQO Step 5 initially is to define the statistical parameter of interest (i.e., mean, 95% upper confidence level) that will be used for comparison against the action level. Table 6 summarizes the decision rule (DR) for the DS provided in Subsection 3.1.2. This DR summarizes the attributes the decision-maker needs to know about the sample population and how this knowledge will guide the selection of a course of action to solve the problem.

Table 6. The decision rule for each decision statement.

DS #	DR #	Decision Rule
1	1	If the mercury concentrations for soil samples collected from the defined areas exceed the final remediation goal of 8.4 mg/kg, then soil will be excavated. Otherwise, the soil will be left in place.
2a	2a	If the TCLP concentrations for any of the three contaminants exceed the RCRA toxicity characteristic levels defined in 40 CFR 261.24, then the contaminated soil will require stabilization prior to disposal. Otherwise, the soil will be directly disposed of at either the ICDF or the CFA landfill without stabilization.
2b	2b	If the concentrations of any of the radionuclides exceed the INEEL background concentrations, then the contaminated soil will be disposed of at the ICDF. Otherwise, the soil will be disposed of at the CFA landfill.
3	3	If the mercury concentrations for soil samples collected in the pond exceed the final remediation goal of 8.4 mg/kg, then additional soil will be excavated. Otherwise, it will be determined that the remedial action was successful.
4	4	If the mercury concentrations for soil samples collected from the fractured basalt exceed the final remediation goal of 8.4 mg/kg, then the residual risk associated with the remaining soil will be assessed. Otherwise, the remaining soil does not pose an unacceptable risk to human health or the environment.
5	5	<p>If the contaminants for the calcine samples collected from bottles found during the remedial action are less than 260 mg/kg for total mercury, not characteristic by TCLP, and less than background for radionuclides, then the calcine will be disposed of in the CFA landfill.</p> <ul style="list-style-type: none"> Less than 260 mg/kg for total mercury, not characteristic by TCLP, and greater than background for radionuclides, then the calcine will be disposed of in the CFA landfill.

Table 6. (continued).

DS #	DR #	Decision Rule
		<ul style="list-style-type: none"> Less than 260 mg/kg for total mercury, characteristic by TCLP, and greater than background for radionuclides but less than the ICDF waste acceptance criteria, then the calcine will be disposed of in the ICDF. Less than 260 mg/kg for total mercury, characteristic by TCLP, and less than the ICDF waste acceptance criteria for radionuclides, then the calcine will be stabilized and disposed of in the ICDF. Greater than 260 mg/kg for total mercury and less than the off-Site treatment and disposal facilities' waste acceptance criteria for radionuclides, then the calcine will be shipped off-Site for retort.
		Otherwise, an alternative treatment or disposal facility will need to be determined.
CFA = Central Facilities Area CFR = Code of Federal Regulations DR = decision rule DS = decision statement ICDF = INEEL CERCLA Disposal Facility INEEL = Idaho National Engineering and Environmental Laboratory RCRA = Resource Conservation and Recovery Act TCLP = toxicity characteristic leaching procedure		

3.1.6 Decision Error Limits

Because analytical data can only estimate the true condition of the site under investigation, decisions that are made based on measurement data could be in error (i.e., decision error). For this reason, the primary objective of DQO Step 6 is to determine which decision statements (if any) require a statistically based sample design. The purpose of determining the decision error limits is to specify the decision-maker's tolerable limits on decision errors, which are used to establish performance goals for the data collection design.

Tolerable error limits assist in the development of sampling designs to ensure that the spatial variability and sampling frequency are within specified limits. Taking into consideration the timeframe in which each of the decision statements apply, the qualitative consequences of an inadequate sampling design, and the accessibility of the site if re-sampling is required, the soil affected by DS 3 has been retained for a statistical sampling design. For DSs 1, 2a, 2b, 4, and 5, the selection of the collection locations for the sampling is based on professional judgment rather than statistics. Therefore, error limits are not used in the determination of sampling locations or frequency.

For confirmation sampling represented by DS 3, the two types of decision errors that could occur are (1) treating (i.e., managing and disposing of) clean site media as if it were contaminated and (2) treating (i.e., managing and disposing of) contaminated site media as if it were clean. The decision error that has the more severe consequence is the latter, because the error could result in human health or ecological impacts. Given the two possible errors, a null hypothesis was developed stating the opposite of what the investigation hopes to demonstrate. The null hypothesis is stated as follows:

- The true mean concentration of mercury exceeds the remedial action goal of 8.4 mg/kg, as stated in the ROD (DOE-ID 2000a).

The statistical parameter of interest is the contaminant concentration representing the 95% upper confidence level (UCL) of the true population mean. The gray region will be taken to be from 80 to 100% of the prescribed remedial action goal. For the DSs to which a nonstatistical sampling design will be applied, there is no need to define the gray region or the tolerable limits on the decision error, because these only apply to statistical designs.

3.1.7 Optimize the Design

The objective of DQO Step 7 is to present alternative data collection designs that meet the minimum data quality requirements, as specified in DQO Steps 1 through 6. A selection process then is used to identify the most resource-effective data collection design that satisfies all the data quality requirements.

For DSs 1, 2a, and 2b, sampling will occur within an area where windblown calcine beads visually have been detected. The objective is to obtain analytical results that allow for the definition of an excavation zone. Therefore, an initial grid will be laid over the zone with samples collected at each node of the grid. These samples will be analyzed using the field instrumentation to determine the horizontal extent of the mercury contamination exceeding the 8.4-mg/kg remediation goal. Following this initial determination, the vertical extent of the excavation boundaries will be further refined through the collection of soil samples for mercury analysis as well as TCLP metals and radionuclide analyses to characterize the waste soil for disposal.

For DS 4, samples of the soil remaining in each of the major basalt fractures will be collected. An average concentration of the mercury levels in the remaining soil will be obtained from which an assessment of the residual risk, if determined to be necessary, can be made. For DS 5, samples of any bottles of calcine found during the remedial action will be combined to form a composite sample for analysis.

The soil addressed in DS 3 will be sampled following a statistical design. The following subsections present the selected field screening and sampling methods for resolving the DS, along with a summary of the proposed implementation design.

3.1.7.1 Statistical Sampling Design. A statistically based sampling design will be used to determine whether the final remediation goal for the CFA-04 mercury pond has been met. Field screening will be used to identify any residual contamination at the remediation site and to support decisions in the field as to whether further excavation is warranted. The final status of the site will be based on confirmation sample data. Screening measurements for mercury also will be used to support the final status decision for CFA-04.

The initial removal of soil at the CFA-04 mercury pond will be based on the analytical results obtained from the prerediation sampling performed during the summer of 2002. Excavated areas then may be surveyed using field-portable instrumentation to determine whether any residual contamination remains that would warrant additional excavation. The removal and field screening process could require multiple iterations before the final remediation goal of 8.4 mg/kg is achieved. Use of field screening instrumentation will minimize the number of iterations and increase the efficiency of the removal by positively identifying residual contamination areas. Because of the comprehensive nature of the field screening approach, using the field screening data to support the confirmation sampling effort will minimize the number of confirmation samples. A limited number of confirmation samples then will be collected from the area on a random grid to demonstrate that the CFA-04 mercury pond area soil does not contain residual contamination at or above the final remediation goal.

To obtain an initial estimate of the population variance of the mercury concentrations in the soil, field-screening data will be used. A minimum of 30 samples will be collected and subjected to analysis using the RA-915+ Mercury Analyzer equipped with the RP-91C attachment (see Section 6.1.4). The variance estimate obtained will be used to calculate the number of confirmation samples required. The following equation will be used to calculate the minimum number of confirmation samples required to determine whether the final remediation goal has been met (EPA 1994):

$$n_d = \sigma^2 \left\{ \frac{z_{1-\beta} + z_{1-\alpha}}{C_s - \mu_l} \right\}^2 + \frac{1}{2} (z_{1-\alpha})^2 \quad (1)$$

where

- n_d = number of samples
- σ^2 = sample variance
- $z_{1-\beta}$ = critical value for a false negative
- $z_{1-\alpha}$ = critical value for a false positive
- C_s = final remediation goal
- μ_l = mean concentration (lower bound of the gray region) where the site should be declared clean.

If the calculated number of samples is less than 20, then 20 samples will be collected. If the calculated number of samples is greater than or equal to 20, then the calculated number of samples will be collected. The locations for the confirmation samples will be randomly determined from the field measurement locations. Based on the results of the confirmation sample analyses, the variance will be recalculated as will the number of samples required to determine if an adequate number of samples were initially collected. If not, additional sampling may be required to determine that the remediation goals were achieved with a 95% confidence level.

After collection and analysis, the 95% UCL will be compared to the final remediation goal for mercury in the soil. If the data are normally distributed, the null hypothesis will be tested by comparing the 95% UCL to the final remediation goal. Normality of the data will be tested graphically and through use of the Shapiro-Wilk statistic (i.e., a statistical calculation). If data are not normally distributed, then an appropriate transform (i.e., log normal) will be implemented. If transformation of the data is necessary, then the transformed 95% UCL will be compared to the transformed cleanup standard. The transformed 95% UCL shall not be transformed back for comparison to the untransformed cleanup standard. The 95% UCL is given by the following equation:

$$UCL = \bar{X} + \frac{(t \cdot s)}{\sqrt{n}} \quad (2)$$

where

- \bar{X} = population mean
- t = t-statistic from tables
- s = standard deviation
- n = number of samples.

The t-value is based on the degrees of freedom that are defined as the number of measurements/samples above the instrument detection limit minus one. Any measurements that are identified as “less-than-detectable” will not be considered in the calculation of the UCL. However, when calculating the sample population mean, less-than-detectable values will be taken as the calculated instrument detection limit.

As noted above, the selected sampling design was based on the error tolerances (discussed in Section 3.1.6) and the needed comparability to other similar remediation sites. The parameters of the selected statistical design for soil that provide the most resource-effective data collection design are summarized as follows:

- Sampling will be a simple random design
- The statistical test of interest is a comparison of the 95% UCL to the final remediation goal
- The false-positive (α) error rate is 5%
- The false negative (β) error rate is 20%
- The lower bound of the gray region is 80% of the final remediation goal
- The upper bound of the gray region is the final remediation goal.

3.2 Quality Assurance Objectives for Measurement

The quality assurance objectives for measurement will meet or surpass the minimum requirements for data quality indicators established in the QAPjP (DOE-ID 2002a). This reference provides minimum requirements for the following measurement quality indicators: precision, accuracy, representativeness, completeness, and comparability. Precision, accuracy, and completeness will be calculated in accordance with the QAPjP (DOE-ID 2002a).

3.2.1 Precision

Precision is a measure of the reproducibility of measurements under a given set of conditions. In the field, precision is affected by sample collection procedures and by the natural heterogeneity encountered in the environment. Overall precision (field and laboratory) can be evaluated by the use of duplicate samples collected in the field. Greater precision typically is required for analytes with very low action levels that are close to background concentrations.

Laboratory precision will be based on the use of laboratory-generated duplicate samples or matrix spike/matrix spike duplicate samples. Evaluation of laboratory precision will be performed during the method data validation process.

Field precision will be based on the analysis of collected field duplicates or split samples. For samples collected for laboratory analyses, a field duplicate will be collected at a minimum frequency of 1 in 20 environmental samples in accordance with the QAPjP (DOE-ID 2002a).

3.2.2 Accuracy

Accuracy is a measure of bias in a measurement system. Laboratory accuracy is demonstrated using laboratory control samples, blind quality control (QC) samples, and matrix spikes. Evaluation of

laboratory accuracy will be performed during the method data validation process. Sample handling, field contamination, and the sample matrix in the field affect overall accuracy. To assess false positive or high-biased sample results, the results from field blanks and equipment rinsates will be evaluated.

Field accuracy will be ensured through the use of appropriate procedures and evaluation of field data versus laboratory analytical data.

3.2.3 Representativeness

Representativeness is a qualitative parameter that expresses the degree to which the sampling and analysis data accurately and precisely represent the characteristic of a population parameter being measured at a given sampling point or for a process or environmental condition. Representativeness will be evaluated by determining whether measurements are made and physical samples are collected in such a manner that the resulting data appropriately measure the media and phenomenon measured or studied. The comparison of all field and laboratory analytical data sets obtained throughout this remedial action will be used to ensure representativeness.

3.2.4 Detection Limits

Detection limits will meet or exceed the risk-based or decision-based concentrations for the contaminants of concern. Detection limits will be as specified in the Sampling and Analysis Management (formerly the Sample Management Office) laboratory master task agreement Statements of Work, task order Statements of Work, and as described in the QAPjP (DOE-ID 2002a).

Detection limits for field instrumentation also will meet or exceed the final remediation goal for the contaminant of concern (i.e., mercury), as discussed in Subsection 3.1.3.4.

3.2.5 Completeness

Completeness is a measure of the quantity of usable data collected during the field sampling activities. The QAPjP (DOE-ID 2002a) requires that an overall completeness goal of 90% be achieved for noncritical samples. If critical parameters or samples are identified, a 100% completeness goal is specified. Critical data points are those sample locations or parameters for which valid data must be obtained in order for the sampling event to be considered complete.

The end use of the data generated as a result of this sampling activity serves three purposes, as discussed in Subsection 3.1.1. Because one of the primary purposes of the data is to determine whether the final remediation goal for mercury in soil has been met, the data will be considered critical with a completeness goal of 100%. For this project, all field-screening data will be considered noncritical with a completeness goal of 90%.

3.2.6 Comparability

Comparability is a qualitative characteristic that refers to the confidence with which one data set can be compared to another. At a minimum, comparable data must be obtained using unbiased sampling designs. If sampling designs are biased, the reasons for selecting another design should be well documented. Data comparability will be assessed through the comparison of all data sets collected during this study using the following parameters:

- Data sets will contain the same variables of interest

- Units will be expressed in common metrics
- Similar analytical procedures and quality assurance (QA) will be used to collect data
- Time measurements of variables will be similar
- Measuring devices will have similar detection limits
- Samples within data sets will be selected in a similar manner
- Number of observations will be of the same order of magnitude.

3.3 Data Validation

Method data validation is the process whereby analytical data are reviewed against set criteria to ensure that the results conform to the requirements of the analytical method and any other specified requirements. All of the laboratory-generated analytical data will be reviewed in accordance with GDE-7003, “Levels of Analytical Method Data Validation.” A cursory review of all the laboratory-generated data will be performed to ensure that contractual requirements have been met. Because the confirmation sample data will be used to determine whether the final remediation goal has been met, all confirmation data will be validated to Level B. Level B validation is a less stringent validation level, requiring review of all laboratory quality assurance/quality control data, but not the raw data generated as a result of the analytical process.

Field-generated data will not be validated. Quality of the field-generated data will be ensured through adherence to established operating procedures and use of equipment calibration, as appropriate. Calibration of the field equipment will include the preparation of a calibration curve based on standards traceable to the National Institute of Standards and Technology. The equipment will be operated following the manufacturer’s instructions. A Hazard Screening Checklist will be completed in accordance with MCP-3562, “Hazard Identification, Analysis and Control of Operational Activities,” to ensure that all hazards associated with the operation of the equipment have been identified and appropriate steps have been taken to mitigate those hazards.

4. SAMPLING LOCATION AND FREQUENCY

The material presented in this section is intended to support the DQOs summarized in Section 3.

4.1 Quality Assurance/Quality Control Samples

The QA samples will be included to satisfy the QA requirements for the field operations in accordance with the QAPjP (DOE-ID 2002a). The duplicate, blank, and calibration quality assurance/quality control (QA/QC) samples will be analyzed, as outlined in Section 3.

4.2 Sampling Location and Frequency

The following subsections discuss the sampling location and frequency for the additional preresmediation sampling, the confirmation sampling, and the sampling of the basalt fractures.

4.2.1 Preresmediation Samples

Additional windblown calcine recently was discovered outside Zone 2T (labeled as Zone 2A in Figure 3) and was confirmed by analysis of a grab sample with the mercury field analyzer. For the effort needed to further refine the horizontal and vertical extent of this contamination in those areas where data gaps have been identified (DSs 1, 2a, and 2b), sampling will occur in two phases. First, a 7.6×7.6 -m (25×25 -ft) grid will be established over the area identified in Figure 3 as Zone 2A. Surface soil samples will be collected from each node of the grid that falls within the zone. The mercury concentration for each of these samples will be determined using the field mercury analysis system. Based on these data, the horizontal boundaries of the proposed excavation zone will be established. The second phase of this effort will involve the collection of 15-cm (6-in.) core samples within the established horizontal boundaries. Four core-sample locations will be randomly selected within the defined boundary and cores will be collected down to 0.6 m (2 ft). The 15-cm (6-in.) segments of each core will be combined to provide one analytical composite sample to be submitted to the laboratory. Therefore, a total of four composite samples, each representative of the defined depth interval, will be submitted to the analytical laboratory for total mercury, TCLP metals, and radionuclide analyses.

4.2.2 Confirmation Samples

To determine the number of confirmation samples required, an estimate of the mean and variance initially will be obtained by analyzing a minimum of 30 samples using the field mercury analysis system. Field sampling will be performed randomly before and during excavation to determine the levels of mercury contamination in the soil. Field sampling will be performed on the sides as well as the bottom of all excavated areas. The estimates of the mean and variance obtained from the final field sample results from the excavated areas then will be used to calculate the number of confirmation samples following the methodology outlined for Equation (1). The required number of confirmation samples then will be collected, as described in Section 6, with 20% of the confirmation samples collected along the vertical faces of the excavation.

Figure 3 provides a 7.6×7.6 -m (25×25 -ft) grid overlay of the CFA-04 mercury pond. Each intersection delineates a potential sampling point for collecting the confirmation samples required to determine whether the final remediation goals have been met.



Figure 3. Central Facilities Area-04 excavation zones.

The sampling locations were randomly generated from an Excel spreadsheet into which each of the potential sampling points had been entered. The potential sampling points have been selected from those areas of the mercury pond that will be excavated during the remediation effort. Areas of the mercury pond that are not to be excavated during the remedial action were determined to be below the cleanup standard during the prerediation sampling conducted during the summer of 2002. No additional samples will be collected in these areas. Each sampling location was assigned a unique number up to the maximum number of grid nodes. This provides each sampling point an equal opportunity for selection. A random number generator then was used to select numbers corresponding to the sampling points without replacement. That is to say, once a number representing a location had been selected, it was removed from the pool of potential numbers, making it ineligible to be selected another time.

Table 7 provides a listing of locations for collection of 50 confirmation samples. The exact number of confirmation samples will not be known until the calculations are performed using the data generated from the field analyses. Once this value is available, the final confirmation sample locations can be determined by beginning at the top of Table 7 and proceeding down until locations are determined for the required number of samples. If the calculated number of samples exceeds 50, the project's technical task leader will be contacted to generate the requisite number of locations based on the calculated number.

Table 7. Confirmation sample collection locations.

Sample	Northing	Easting	Sample	Northing	Easting
1	677457	293350	26	677475	293525
2	677325	293400	27	677325	293125
3	677525	293600	28	677275	293150
4	677375	293525	29	677400	293500
5	677400	293325	30	677400	293200
6	677375	293150	31	677375	293400
7	677275	293375	32	677275	293475
8	677350	293550	33	677550	293625
9	677450	293375	34	677350	293275
10	677425	293225	35	677300	293325
11	677400	293350	36	677325	293575
12	677425	293575	37	677350	293175
13	677425	293300	38	677350	293325
14	677375	293375	39	677500	293575
15	677325	293500	40	677250	293500
16	677275	293225	41	677325	293375
17	677400	293175	42	677450	293250
18	677475	293600	43	677450	293650
19	677375	293250	44	677400	293525
20	677300	293500	45	677525	293350
21	677575	293675	46	677400	293125
22	677550	293375	47	677500	293675
23	677425	293125	48	677300	293550
24	677275	293425	49	677250	293275
25	677375	293300	50	677475	293500

4.2.3 Basalt Fracture Samples

To assess the residual risk associated with the soil remaining in the basalt fractures, a single 15-cm (6-in.) core sample will be collected from each of the major fractures (defined as greater than 5 cm [2 in.] in width. If a core sample cannot be obtained, then either a grab sample will be collected from the remaining soil or a sample of the evacuated soil representative of the final 15 cm (6 in.) will be used. These samples will be submitted to the analytical laboratory for total mercury analysis.

4.2.4 Calcine Bottle Samples

To determine the waste disposition pathway for any bottles of calcine found during the remedial action, a single composite sample composed of aliquots from the individual bottles will be collected. This sample will be submitted to the analytical laboratory for total mercury, TCLP metals, and radionuclide analyses.

5. SAMPLING DESIGNATION

5.1 Sample Identification Code

A systematic character identification (ID) code will be used to uniquely identify all laboratory samples. Uniqueness is required for maintaining consistency and preventing the same ID code from being assigned to more than one sample.

The first three designators of the code will always be **4**, **R**, and **4**. The first **4** refers to the sample as originating from WAG 4. The **R** refers to the sample being collected in support of the remedial action sampling effort. The next **4** refers to the sample being collected from CFA-04 mercury pond. The next three numbers designate the sequential sample number for the project. A two-character set (i.e., 01, 02) then will be used to designate field duplicate samples. The last two characters refer to a particular analysis and bottle type. Refer to the SAP tables in Appendix A for specific bottle code designations.

For example, a soil sample collected in support of determining the mercury concentration might be designated as 4R400101HG where (from left to right):

- **4** designates the sample as originating from WAG 4
- **R** designates the sample as being collected in support of the remedial action sampling effort
- **4** designates the sample as being collected from CFA-04
- **001** designates the sequential sample number
- **01** designates the type of sample (01 = original, 02 = field duplicate)
- **HG** designates mercury analysis.

A SAP table/database will be used to record all pertinent information associated with each sample ID code.

5.2 Sampling and Analysis Plan Table/Database

A SAP table format was developed to simplify the presentation of the sampling scheme for project personnel. The following sections describe the information recorded in the SAP table/database, which is presented in Appendix A.

5.2.1 Sample Description

The sample description fields contain information relating to individual sample characteristics.

5.2.1.1 Sampling Activity. The sampling activity field contains the first six characters of the assigned sample number. The sample number in its entirety will be used to link information from other sources (i.e., field data, analytical data) to the information in the SAP table for data reporting, sample tracking, and completeness reporting. The analytical laboratory will also use the sample number to track and report analytical results.

5.2.1.2 Sample Type. Data in this field will be selected from the following:

REG for a regular sample

SPLIT SAMPLE for a split sample

QC for a QC sample.

5.2.1.3 Media. Data in this field will be selected from the following:

SOIL for soil samples

WATER for QA/QC water samples.

5.2.1.4 Collection Type. Data in this field will be selected from the following:

GRAB for grab sample collection

COMP for composite sample collection

CORE for core sample collection

RNST for rinsate QA/QC samples

DUP for field duplicate samples.

FBLK for field blank QA/QC samples

5.2.1.5 Planned Date. This date is related to the planned sample collection start date.

5.2.2 Sample Location Fields

This group of fields pinpoints the exact location for the sample in three-dimensional space, starting with the general AREA, narrowing the focus to an exact location geographically, and then specifying the DEPTH in the depth field.

5.2.2.1 Area. The AREA field identifies the general sample collection area. This field should contain the standard identifier for the INEEL area being sampled. For this investigation, samples are being collected from CFA, and the AREA field identifier will correspond to this site.

5.2.2.2 Location. The LOCATION field may contain geographical coordinates, x-y coordinates, building numbers, or other location-identifying details, as well as program-specific information such as borehole or well number. Data in this field normally will be subordinated to the AREA. This information is included on the labels generated by Sampling and Analysis Management to aid sampling personnel.

5.2.2.3 Type of Location. The TYPE OF LOCATION field supplies descriptive information concerning the exact sample location. Information in this field may overlap that in the location field, but is intended to add detail to the location.

5.2.2.4 Depth. The DEPTH of a sample location is the distance in feet from land surface level or a range in feet from the land surface.

5.2.3 Analysis Types

5.2.3.1 AT1-AT20. These fields indicate analysis types (e.g., radiological, chemical, hydrological). Space is provided at the bottom of the form to clearly identify each type. A standard abbreviation also will be provided, if possible.

6. SAMPLING PROCEDURES AND EQUIPMENT

The following subsections describe the sampling procedures and equipment to be used for the planned sampling and analyses described in this FSP. Before beginning any sampling activities, a prejob briefing will be held to review the requirements of the FSP and the project HASP (INEEL 2002) and to ensure that all supporting documentation has been completed.

6.1 Sampling Requirements

Requirements for the CFA-04 mercury pond confirmation sampling activity are outlined in the following subsections.

6.1.1 Site Preparation

All required documentation and safety equipment will be assembled at the sampling site, including radios, fire extinguishers, personal protective equipment, sample bottles, sampling tools and equipment, and accessories. All sampling personnel are responsible for having read both this FSP and the project HASP (INEEL 2002) before sampling. The field team leader (FTL) will perform a daily site briefing to discuss potential hazards and ensure that all personnel have the required training. The FTL will assign a team member to maintain document control and note this appointment in the FTL's logbook in accordance with TPR-4910, "Logbook Practices for ER and Deactivation, Decontamination, and Decommissioning Projects."

6.1.2 Sample Collection

For collection of the core samples required for the remaining soil in the fractured basalt and the prerediation sampling effort, a hand corer shall be used in accordance with the procedures outlined in TPR-6673, "Collecting Samples Using a Hand Corer." For the vertical prerediation effort, samples will be subdivided from the core at set intervals. The analytical sample submitted to the laboratory will consist of a composite of the individual core samples collected from a discrete depth within Zone 2A. The individual sample aliquots combined for the composite sample will be collected using disposable sampling spoons. For the fractured basalt soil, the 15-cm (6-in.) core from each fracture will be submitted to the laboratory for analysis.

For collection of confirmation samples, surface samples will be required. Table 8 provides the specific sample requirements for the required analyses. For the collection of surface soil samples, either sampling scoops or spoons shall be used in accordance with the procedures outlined in TPR-6675, "Collecting Samples Using Scoops, Spoons, and Shovels." Discrete grab samples shall be collected to a depth of 15 cm (6 in.). The confirmation samples will be placed in the appropriate containers and preserved in accordance with EPA protocol.

For collection of characterization samples from bottles of calcine found during the remedial action, a composite sample will be collected and submitted for analyses. The composite will be comprised of a combination of all the contents of the calcine bottles together to form a homogeneous mixture from which the analytical aliquots will be obtained. If more calcine bottles are found than can safely be handled as a single bulk sample, then aliquots will be collected from individual bottles based on the volume of the individual bottles in comparison to the overall volume of calcine available.

Table 8. Specific sample requirements.

Analytical Parameter	Container Size	Container Type	Preservative Used	Analytical Method	Laboratory Holding Time
Soil/Sediment Samples					
Mercury	4 oz	Glass	Cool to 4°C	SW-846 Method 7471A	28 days
TCLP metals	8 oz	Glass	Cool to 4°C	SW-846 Method 1311/7000 series	28 days for Hg; 6 months for all others
Radionuclides	16 oz	HDPE	None	Radiochemical	6 months
Liquid Samples (Equipment Rinsates)					
Hg/Cr/Ag	1 L	HDPE	HNO ₃ to pH<2, Cool to 4°C	SW-846 Method 7470A	28 days for Hg; 6 months for Cr and Ag
Radionuclides	2 L	HDPE	HNO ₃ to pH<2	Radiochemical	6 months

HDPE = high-density polyethylene
TCLP = toxicity characteristic leaching procedure

6.1.3 Decontamination

All sampling equipment that comes in contact with the sample media will be decontaminated following the procedures delineated in TPR-6676, “Decontaminating Sampling Equipment.” Dry decontamination methods will be used to the extent practicable to minimize the generation of liquid decontamination waste. For sampling equipment used in the vicinity where asbestos-containing material roofing was buried, liquid decontamination techniques shall be followed, whereby a wet wipe consisting of a terry cloth towel shall be dampened with amended water and with a surfactant to coat any asbestos-containing material that might be present.

6.1.4 Mercury Field Screening

Soil samples will be screened for mercury content using a field analytical technique. The Zeeman Mercury Analyzer RA-915+ operates on the principle of thermal decomposition of the sample allowing for direct detection of mercury using atomic absorption spectrometry. Coupled with the RP-91C Pyrolysis Attachment, the instrument is capable of achieving detection limits on the order of less than 1 µg/kg using a 200-mg soil sample. The instrument will be operated in accordance with the manufacturer’s instructions.

The following correlation study was performed for the instrument. Preremediation samples, collected in accordance with the preremediation FSP and previously submitted for laboratory analysis following EPA protocol, were analyzed using the RA-915+. Two separate calibration curves were prepared using National Institute of Standards and Technology certified soil standards. One curve was prepared using a standard soil containing 32.6 mg/kg mercury with the second curve prepared using a certified standard soil containing 6.25 mg/kg mercury (see Figures 4 and 5). For the higher level standard, 59 samples were analyzed with 61 samples analyzed for the lower level standard. The correlation coefficients for the RA-915+ data compared to the laboratory-generated data were 0.89 for each standard. Therefore, it is concluded that the RA-915+ data correlate fairly well with the data produced by the laboratory using the EPA-prescribed method.

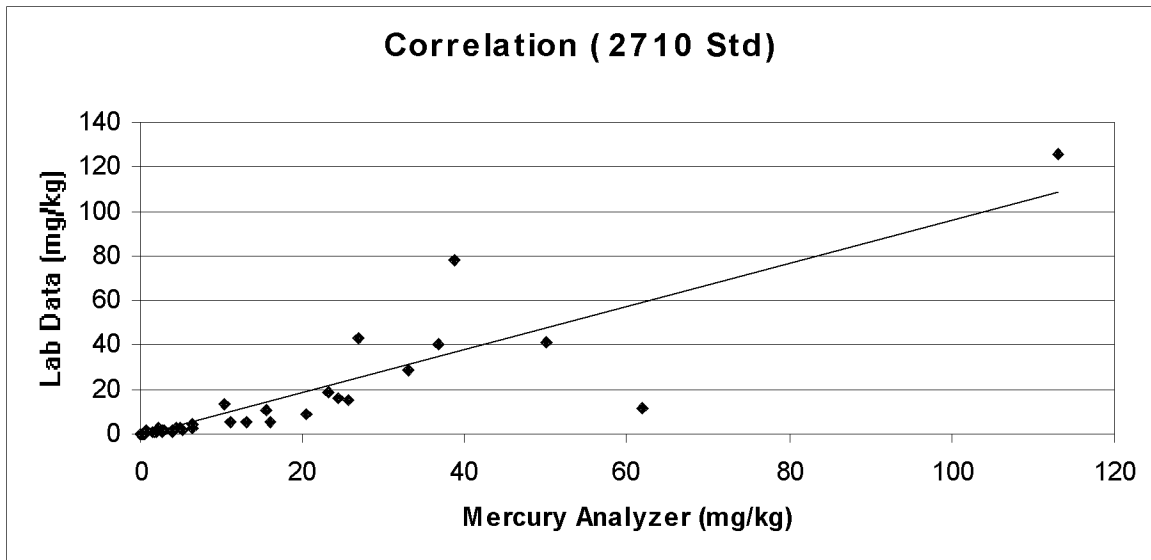


Figure 4. Correlation curve for the mercury field instrument using the 32.6-mg/kg mercury standard.

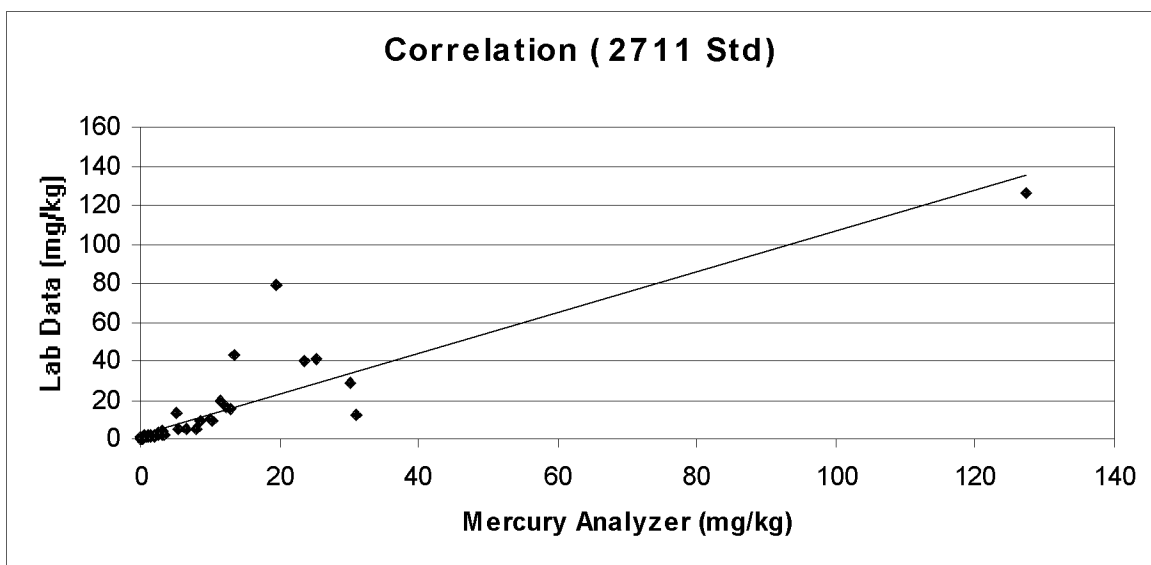


Figure 5. Correlation curve for the mercury field instrument using the 6.25-mg/kg mercury standard.

6.1.5 Shipping Screening

Because radionuclide contamination is at background levels for the CFA-04 mercury pond, Radiological Control screening methods will suffice for screening. In the event that a sample is questionable, it may be submitted to the Radiation Measurements Laboratory, which is located at the Test Reactor Area at the INEEL, for a 20-minute gamma screen prior to shipment. Gamma screening will require that a separate sample be collected for analysis.

6.1.6 Sample Shipping

Samples will be transported in accordance with the regulations promulgated in 49 CFR Parts 173 through 178 and EPA sample handling, packaging, and shipping methods delineated in 40 CFR 262 Subpart C and 40 CFR 263. Additional information pertaining to sample shipping is found in MCP-3480, “Environmental Instructions for Facilities, Processes, Materials, and Equipment.” All samples will be packaged and transported to protect the integrity of the samples and prevent sample leakage.

Upon receipt, laboratory personnel will verify the condition of the samples, including temperature (if samples are required to be shipped under controlled-temperature conditions). The laboratory will communicate any discrepancies to the field personnel and the project through Sampling and Analysis Management. The project personnel will determine the appropriate corrective action on a case-by-case basis.

6.2 Handling and Disposition of Remediation Waste

Characterization waste will be generated during the sampling activities, as described herein. The disposition and handling of waste for this project will be consistent with the *Waste Certification Plan for the Environmental Restoration Program* (Jones 1997). Samples will be handled in accordance with MCP-3480, “Environmental Instructions for Facilities, Processes, Materials, and Equipment.” All waste streams generated from the sampling activity will be characterized in accordance with MCP-62, “Waste Generator Services—Low-Level Waste Management,” or MCP-70, “Waste Generator Services—Mixed Low-Level Waste Management,” and will be handled, stored, and disposed of accordingly.

All CERCLA-generated waste will be maintained in accordance with the requirements of the previously established CERCLA waste storage unit (CWSU) in which the waste is stored. All CWSUs at the INEEL have been established in accordance with the applicable or relevant and appropriate requirements (ARARs). This waste shall be maintained in compliant storage until it can be disposed of at the INEEL CERCLA Disposal Facility (ICDF).

Waste will be generated as a result of the sampling activities conducted during this project. Waste expected to be generated includes the following:

- Personal protective equipment
- Liquid decontamination residue
- Solid decontamination residue
- Plastic sheeting
- Unused/unaltered sample material
- Sample containers
- Miscellaneous waste
- Contaminated equipment.

Waste could be hazardous. As sampling continues, additional waste streams might be identified. All new waste streams, as well as those identified above, are required to have the waste identified and characterized. A hazardous waste determination must be completed and presented to the appropriate waste management organization (e.g., Waste Generator Services [WGS]) for approval by that organization at the time of generation.

The waste associated with the sampling activities will be managed in a manner that complies with the established ARARs, protects human health and the environment, and achieves minimization of remediation waste to the extent possible. The ARARs applicable to the storage of waste are defined in accordance with the ROD (DOE-ID 2000a). The basic provisions of the ARARs provide for appropriate waste containerization and compliant storage of the waste for an interim storage period. Protection of human health and the environment is achieved through implementation of the ARARs and through implementation of the waste management approach described herein.

6.2.1 Waste Minimization

Waste minimization techniques will be incorporated into planning and daily work practices to improve worker safety and efficiency. In addition, such techniques will aid in reducing the project environmental and financial liability. Specific waste minimization practices that will be implemented during the project will include, but not be limited to, the following:

- Excluding materials that could become hazardous waste in the decontamination process (if any)
- Controlling transfer between clean and contaminated zones
- Designing containment such that contamination spread is minimized
- Collecting all samples necessary at one time, so that additional waste is not generated as the result of re-sampling.

The *U.S. Department of Energy, Idaho Operations Office Idaho National Engineering and Environmental Laboratory Pollution Prevention Plan* (DOE-ID 1997) addresses the efforts to be expended and the reports required to track waste generated by projects. That plan directs that the volume of waste generated by INEEL operations be reduced as much as possible.

Industrial waste does not require segregation by type; therefore, containers will be identified as industrial waste and maintained outside the controlled area for separate collection. Industrial waste is defined as solid waste generated by industrial processes and manufacturing. Industrial waste is not radioactive, hazardous, or mixed waste (40 CFR 243.101). Contaminated waste has the potential to be hazardous. This waste will require segregation as either incinerable (e.g., wipes, personal protective equipment) or nonincinerable (e.g., polyvinyl tubing), in anticipation of subsequent waste management. Containers for collection of contaminated waste will be clearly labeled to identify waste type and will be maintained inside the controlled area, as defined in the project HASP (INEEL 2002), until removal for subsequent management.

6.2.2 Laboratory Samples

All laboratory and sample waste will be managed in accordance with Sampling and Analysis Management master task agreements as part of the contract for the subcontracted laboratory. The laboratory will dispose of any unused sample material. The laboratories are responsible for any waste generated as a result of analyzing the samples. In the event that unused sample material must be returned from the laboratory, only the unused, unaltered samples in the original sample containers will be accepted from the laboratory. These samples will be returned to the waste stream from which they originated. If the laboratory must return altered sample material (e.g., analytical residue), the laboratory specifically will define the types of chemical additives used in the analytical process and assist in making a hazardous waste determination. This information will be provided to the project FTL and environmental compliance coordinator. Management of this waste also will require separation from the other unaltered samples being returned.

6.2.3 Packaging and Labeling

Containers used to store and transport hazardous waste must meet the requirements of 40 CFR 264, Subpart I, "Use and Management of Containers." The *Idaho National Engineering and Environmental Laboratory Waste Acceptance Criteria* (DOE-ID 2002b) contains additional details concerning packaging and container conditions. Appropriate containers for CERCLA waste include 208-L (55-gal) drums and other suitable containers that meet the U.S. Department of Transportation's regulations on packaging (49 CFR 171, 173, 178, and 179) or the requirements outlined in the INEEL Waste Acceptance Criteria document (DOE-ID 2002b). The WGS will be consulted to ensure that the packaging is acceptable to the receiving facility.

Waste containers will be labeled with standard CERCLA remediation waste labels. The following information will be included on the labels:

- Unique bar code serial number
- Name of generating facility (e.g., OU 4-13)
- Phone number of generator contact
- Listed or characteristic waste codes
- Waste package gross weight
- Waste accumulation start date
- Maximum radiation level on contact and at 1 m (3 ft) in the air
- Waste stream or material identification number as assigned by the receiving facility
- Prior to shipping, other labels and markings as required by 49 CFR 172, Subparts D and E.

Any of the above information that is not known when the waste is labeled may be added when the information is known.

The unique bar code serial number is used for tracking and consists of a five-digit number followed by a single alpha designator. The alpha designator indicates which facility generated the bar code. Currently, only the Waste Reduction Operations Complex generates the bar codes and its alpha designator is "K." The Waste Reduction Operations Complex will furnish these bar codes in lots of 50. A new bar code will be affixed to each container when waste is first placed in the container.

Any waste shipped off the INEEL from WAG 4 must be labeled in accordance with applicable U.S. Department of Transportation labels and markings (49 CFR 172). In addition, waste labels must be visible, legibly printed or stenciled, and placed so that a full set of labels and markings are visible. See the INEEL Waste Acceptance Criteria document (DOE-ID 2002b) for additional labeling information.

6.2.4 Storage and Inspection

Waste may be stored in an established CWSU. Solid waste segregated as potentially hazardous or mixed and placed in 208-L (55-gal) drums will be stored in the CWSU. The waste will be stored in either one of two CWSUs previously established at the INEEL. These units include CFA-637-101-A, located at

CFA, and CPP-1789-000-A, located at the Idaho Nuclear Technology and Engineering Center. To meet the substantive requirements of 40 CFR 264, Subpart I, the RCRA ARARs inspection of the CWSU will be conducted as part of the weekly waste container inspection. The purposes of the weekly container inspection are to look for containers that are leaking or that are deteriorating as a result of corrosion or other factors, to ensure that the containment system has not deteriorated as a result of corrosion, and to verify that labels are in place and legible. Inspections of the containers and the CWSU are conducted to meet the guidance contained in MCP-3475, "Temporary Storage of CERCLA-Generated Waste at the INEEL." Once completed, the inspections will be documented on a weekly inspection form. The WGS will maintain the checklists used to guide the inspection.

6.2.5 Personal Protective Equipment

Personal protective equipment requiring disposal may include, but not be limited to, gloves, respirator cartridges, shoe covers, and coveralls. Personal protective equipment will be disposed of in accordance with the requirements set forth in the INEEL Waste Acceptance Criteria document (DOE-ID 2002b) and the *Waste Certification Plan for the Environmental Restoration Program* (Jones 1997).

6.2.6 Hazardous Waste Determinations

All waste generated will be characterized as required by 40 CFR 262.11, "Hazardous Waste Determination." Hazardous waste determinations will be prepared for all waste streams according to the requirements set forth in MCP-62, "Waste Generator Services—Low-Level Waste Management," or MCP-70, "Waste Generator Services—Mixed Low-Level Waste Management." Completed hazardous waste determinations will be maintained for all waste streams as part of the project file held by WGS. The hazardous waste determinations may use two approaches to determine whether a waste is characteristic. The two determinations are as follows:

1. Process knowledge may be used if enough information exists to characterize the waste. Process knowledge may include direct knowledge of the source of the contamination or existing validated analytical data.
2. Analysis of representative samples of the waste stream may be performed by specialized RCRA protocols, standard protocols for sampling and laboratory analysis that are not specialized RCRA methods, or other equivalent regulatory-approved methods. In addition, process knowledge may influence the amount of sampling and analysis required in order to perform characterization.

Land disposal restrictions for hazardous waste are addressed in 40 CFR 268, "Land Disposal Restrictions." The INEEL-specific requirements for treatment, storage, and disposal are addressed in the INEEL Waste Acceptance Criteria document (DOE-ID 2002b). After the hazardous waste determinations are completed, the INEEL Interim Waste Tracking System profile number is assigned, and the appropriate information is entered into the tracking system.

6.2.7 Waste Disposition

At the conclusion of the investigations, or when deemed necessary, industrial waste will be disposed of in the INEEL landfill, following the protocols and completing the forms identified by the INEEL Waste Acceptance Criteria document (DOE-ID 2002b). To achieve this waste management activity, industrial waste will be turned over to CFA operations personnel for management under existing facility waste streams and in accordance with standing facility procedures. When sufficient quantities of waste have been accumulated to ship to one of the INEEL waste management units or off the INEEL to a commercial waste management facility, WGS will be contacted, and the appropriate forms will be completed and submitted for approval, as required. The waste generator interface will provide help in packaging and transporting the waste.

Waste that is determined to be RCRA-hazardous is not intended to be stored in a permitted treatment, storage, and disposal facility. However, if this becomes necessary, the waste will be labeled as CERCLA to facilitate eventual management in accordance with CERCLA treatment, storage, or disposal that could become available. If further characterization of the contaminated waste becomes necessary, services will be requested from WGS and Sampling and Analysis Management. Requesting these services requires completion of Form 435.26, "SMO/WGS Services Request Form." For final disposition of RCRA-hazardous waste, WGS will be contacted to determine whether the waste qualifies for disposal under terms of existing master task agreements.

All low-level radioactive and mixed waste shall be handled and disposed of in accordance with the requirements set forth in the INEEL Waste Acceptance Criteria document (DOE-ID 2002b). Care should be taken to ensure that all containers used to store waste or sampling equipment are in "like-new" condition. After completion of sampling, the individual waste streams destined for disposal at an on-Site facility will be approved and prepared for disposal in accordance with the requirements of the INEEL Waste Acceptance Criteria document (DOE-ID 2002b) and the *Waste Certification Plan for the Environmental Restoration Program* (Jones 1997). In so much as the various waste streams meet the waste acceptance criteria, the intent is to dispose of the waste streams in the ICDF once it becomes operational.

Management of contaminated waste, generated at a subcontract laboratory during analytical testing, will be the responsibility of the subcontract laboratory. However, overall management of the samples must be performed in accordance with the requirements of MCP-3480, "Environmental Instructions for Facilities, Processes, Materials, and Equipment." Specifically, MCP-3480 requires the facility environmental, safety, and health manager to provide written approval prior to return of any media and that written documentation of sample disposition be developed and maintained. To initiate the return of this waste to the INEEL, the subcontract laboratory shall notify Sampling and Analysis Management in the form of a written report identifying the known volume and characteristics of each waste type, including shipping and packaging details. Final authorization for the return of waste will be provided in writing from Sampling and Analysis Management with concurrence from the technical task manager to the subcontract laboratory. In the event that laboratory waste is returned, WGS will be contacted and will be responsible for the disposition of that waste.

Waste streams to be generated during this sampling effort may include the following categories:

- Hg <260 mg/kg, noncharacteristic, nonradiologically contaminated
- Hg <260 mg/kg, characteristic, nonradiologically contaminated
- Hg >260 mg/kg, noncharacteristic or characteristic, nonradiologically contaminated
- Hg <260 mg/kg, noncharacteristic, radiologically contaminated
- Hg <260 mg/kg, characteristic, radiologically contaminated
- Hg >260, noncharacteristic or characteristic, radiologically contaminated.

For waste contaminated with mercury greater than 260 mg/kg, it does not matter whether the soil is characteristic because the prescribed treatment is retort. Most of the waste generated during the sampling effort is expected to have mercury contamination levels less than 260 mg/kg, noncharacteristic, and nonradiologically contaminated. A smaller subset may be radiologically contaminated, with yet smaller subsets consisting of waste that is characteristic for mercury or greater than 260 mg/kg.

6.2.8 Recordkeeping and Reporting

Records and reports related to waste management are required to be maintained, as indicated by MCP-3475, “Temporary Storage of CERCLA-Generated Waste at the INEEL.” Some of these may be completed by others, but must be available either at CFA or within the WAG 4 project files. All information related to the tracking and disposition of waste generated as a result of the sampling effort will be entered into the Integrated Waste Tracking System, which is operated and maintained by WGS. These records shall include, but not be limited to, the following:

- Hazardous waste determinations, characterization information, and statements of process knowledge (by others)
- CWSU and CERCLA storage area inspection reports and log-in, log-out history
- Training records
- Documentation with respect to all spills.

6.3 Project-Specific Waste Streams

Several distinct waste stream types anticipated to be generated during this project have been identified. Some of these waste types will be clean, but many could be contaminated. After generation, any or all of the waste may be reclassified; therefore, the intended waste management strategies for each are outlined in the following subsections, which describe the expected waste that will require compliant storage and/or disposal, including the intended management strategy from the time of generation until final disposition. Field and laboratory personnel will be responsible for segregating waste. The anticipated quantities also have been approximated; however, they are to be considered a rough order of magnitude, because, in some cases, the type of contamination present cannot be determined before sampling and analysis. Estimated waste volumes are based on historical sampling activities conducted in support of other CERCLA actions conducted at the INEEL in addition to calculated volumes based on drawings and discussions with ER personnel.

6.3.1 Personal Protective Equipment

Personal protective equipment in the form of coveralls, leather and rubber gloves, and anticontamination clothing might be generated as a result of the sampling activities. The anticipated quantity of personal protective equipment to be generated and requiring disposal as a result of the sampling activities is 0.76 m³ (1 yd³), classified as clean.

6.3.2 Liquid Decontamination Residue

The decontamination methods for field and sampling equipment will ensure containment of all decontamination fluids, minimize waste, and minimize contamination of equipment. Decontamination fluids will be generated by wet decontamination of field (e.g., drilling equipment) and sampling (e.g., spoons, shovels) equipment. Decontamination fluids could contain oil or grease in addition to any radionuclide or hazardous contamination that could be present. The anticipated quantity of decontamination fluids to be generated and requiring disposal as a result of the sampling activities is 57 L (15 gal), classified based on the site of origin. To verify the end classification of decontamination fluids, a sample of the rinsate water will be submitted for laboratory analysis. It is intended that the liquid decontamination residues will be consolidated and stabilized for eventual disposal in the ICDF. If the residues do not meet the ICDF’s waste acceptance criteria, an alternative treatment and disposal facility will need to be identified.

6.3.3 Solid Decontamination Residue

As with the liquid decontamination residues, solid decontamination methods will ensure the minimization of waste and equipment contamination. Solid decontamination residues will be generated by the dry decontamination of field and sampling equipment. Dry decontamination methods will be used to the extent practicable to minimize the generation of liquid decontamination residues. The anticipated quantity of solid decontamination residues to be generated and requiring disposal as a result of the sampling activities is 57 L (15 gal), classified based on the site of origin. The end classification of the solid decontamination residues will be based on the results of the analytical samples collected from the contaminated source. It is intended that the solid decontamination residues will be consolidated for eventual disposal at the ICDF. If the residues do not meet the ICDF's waste acceptance criteria, an alternative treatment and disposal facility will need to be identified.

6.3.4 Plastic Sheeting

Plastic sheeting may be used as an environmental barrier to contamination and to provide a laydown site for staging equipment and tooling. Based on historical use of plastic sheeting at environmental remediation sites, the anticipated volume to be generated and requiring disposal as a result of the sampling activities is 0.76 m³ (1 yd³), classified as clean.

6.3.5 Unused, Unaltered Sample Material

Unused, unaltered sample material will be generated from the sampling activities in the form of soil and water not required for sampling and analysis. In most cases, the analytical laboratory will be responsible for disposal of the unused, unaltered sample material and any waste generated as a result of analyzing the samples. If the unused sample material must be returned from the laboratory, only the unused, unaltered samples in the original sample containers will be accepted. The unused, unaltered sample material will be returned to the point of origin whenever possible. In instances when sample material cannot be returned to the point of origin, the material will be consolidated for disposal at the ICDF.

6.3.6 Analytical Residues

Analytical residues will be generated from the sample analytical activities conducted by subcontracted laboratories. Though the laboratories are required to dispose of analytical residues under terms of the subcontract, the potential does exist for return of the residues, particularly in the case of materials regulated under the Toxic Substances Control Act. The potential sources of Toxic Substances Control Act-regulated materials at CFA-04 are the asbestos-containing materials associated with roofing buried at the site. Therefore, residues produced by subcontracted laboratories as a result of analyzing samples containing these roofing materials will be returned to the INEEL for final disposition. The anticipated quantity of analytical residues to be generated and requiring disposal as a result of the sampling activities is 57 L (15 gal), classified based upon the site of origin. Any residues returned to the INEEL for disposal will be consolidated for eventual disposal in the ICDF. In the event that the residues do not meet the ICDF's waste acceptance criteria, an alternative treatment and disposal facility will need to be identified.

6.3.7 Sample Containers

Sample containers will become a waste stream following analysis. As with unused, unaltered sample material, the analytical laboratory will be responsible for disposal of the sample containers. If the unused sample material must be returned from the laboratory, the samples will be consolidated for disposal and the sample containers, by virtue of the empty container rule, will be disposed of as clean waste.

6.3.8 Miscellaneous Waste

Miscellaneous waste such as trash, labels, rags, and other miscellaneous debris might be generated during the project. The anticipated quantity of miscellaneous waste to be generated and requiring disposal as a result of the sampling activities is 1.53 m³ (2 yd³), classified as clean. Clean miscellaneous waste will be removed to the CFA landfill.

7. DOCUMENTATION MANAGEMENT AND SAMPLE CONTROL

Subsection 7.1 summarizes document management and sample control. Documentation includes field logbooks used to record field data and sampling procedures. Subsection 7.2 outlines sample handling and discusses chain of custody and radioactivity screening for shipment to the analytical laboratory (if required). The analytical results from this sampling effort will be documented in the semiannual operating/shutdown cycle reports.

7.1 Documentation

The FTL will be responsible for controlling and maintaining all field documents and records and for ensuring that all required documents are submitted to ER Administrative Records and Document Control. All entries will be made in permanent ink. A single line will be drawn through any error with the correct information entered next to it. All corrections will be initialed and dated.

7.1.1 Sample Container Labels

Waterproof, gummed labels generated from the SAP database will display information such as the sample ID number, the name of the project, sample location, and analysis type. In the field, labels will be completed and placed on the containers before collecting the sample. Information concerning sample date, time, preservative used, field measurements of hazards, and the sampler's initials will be filled out during field sampling.

7.1.2 Field Guidance Forms

Field guidance forms, provided for each sample location, will be generated from the SAP database to ensure unique sample numbers and to facilitate sample container documentation and organization of field activities. The forms contain the following information:

- Media
- Sample ID numbers
- Sample location
- Aliquot ID
- Analysis type
- Container size and type
- Sample preservation.

7.1.3 Field Logbooks

In accordance with Administrative Records and Document Control format, field logbooks will be used to record information necessary to interpret the analytical data. All field logbooks will be controlled and managed according to TPR-4910, "Logbook Practices for ER and Deactivation, Decontamination, and Decommissioning Projects."

7.1.3.1 Sample Logbooks. Field teams will use sample logbooks. Each sample logbook will contain information such as the following:

- Physical measurements (if applicable)
- All quality control samples
- Sample date, time, and location
- Shipping information (i.e., shipping dates, cooler ID number, destination, chain of custody number, and name of shipper).

7.1.3.2 Field Team Leader's Daily Logbook. An operational logbook maintained by the FTL will contain a daily summary of the following:

- All the project field activities
- Problems encountered
- Visitor log
- List of site contacts.

This logbook will be signed and dated at the end of each day's sampling activities.

7.1.3.3 Field Instrument Calibration/Standardization Logbook. A logbook containing records of calibration data will be maintained for each piece of equipment requiring periodic calibration or standardization. This logbook will contain sheets to record the date, time, method of calibration, and instrument ID number.

7.2 Sample Handling

Analytical samples for laboratory analyses will be collected in precleaned containers and packaged according to procedures recommended by the American Society for Testing and Materials or the EPA. The QA samples will be included to satisfy the QA requirements for the field operation, as outlined in the QAPjP (DOE-ID 2002a). Only qualified (SAP-approved) analytical and testing laboratories will analyze these samples.

7.2.1 Sample Preservation

Preservation of water samples will be performed immediately upon sample collection. If required for preservation, acid may be added to the bottles before sampling. For samples requiring controlled temperatures of 4°C (39°F) for preservation, the temperature will be checked periodically, prior to sample shipment, to certify adequate preservation. Ice chests (coolers) containing frozen, reusable ice will be used to chill the samples in the field after sample collection, if required.

7.2.2 Chain-of-Custody Procedures

The chain of custody procedures outlined in MCP-3480, "Environmental Instructions for Facilities, Processes, Materials, and Equipment," and the QAPjP (DOE-ID 2002a) will be followed. Sample bottles will be stored in a secured area accessible only to the field team members.

7.2.3 Transportation of Samples

Samples will be shipped in accordance with the regulations issued by the U.S. Department of Transportation (49 CFR Parts 173 through 178) and EPA –sample handling, packaging, and shipping methods (40 CFR 262 Subpart C and 40 CFR 263). All samples will be packaged in accordance with the requirements set forth in MCP-3480, “Environmental Instructions for Facilities, Processes, Materials, and Equipment.”

7.2.3.1 Custody Seals. Custody seals will be placed on all shipping containers in such a way as to ensure that tampering or unauthorized opening does not compromise sample integrity. Clear, plastic tape will be placed over the seals to ensure that the seals are not damaged during shipment.

7.2.3.2 On-Site and Off-Site Shipping. An on-Site shipment is any transfer of material within the perimeter of the INEEL. Site-specific requirements for transporting samples within Site boundaries and those required by the shipping/receiving department will be followed. Shipment within the INEEL boundaries will conform to U.S. Department of Transportation requirements, as stated in 49 CFR, “Transportation.” All shipments will be coordinated with WGS, as necessary, and will conform to the applicable packaging and transportation MCPs. Radiological Control personnel will screen all samples to be removed from the task site for radiological contaminants before the samples are shipped.

7.3 Document Revision Requests

Revisions to this document will follow the requirements set forth in MCP-135, “Creating, Modifying, and Canceling Procedures and Other DMCS-Controlled Documents.” Any significant revisions to this document will require the concurrence of the DOE-ID, the Idaho Department of Environmental Quality, and the EPA.

8. REFERENCES

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Appendix A
Sampling and Analysis Plan Tables

Plan Table Number: CFA-04-HG-POND

SAP Number: DOEID-11034

Date: 12/20/2002

Plan Table Revision: 00

Project: CFA-04-MERCURY POND

Project Manager: WAGONER, D W

Sampler: Lopez, L A

SMD Contact: KIRCHNER, D R

DRAFT

Sample Description					Sample Location					Enter Analysis Types (AT) and Quantity Requested																			
Sampling Activity	Sample Type	Sample Matrix	Coil Type	Sampling Method	Planned Date	Area	Type of Location	Location	Depth (ft)	AT1	AT2	AT3	AT4	AT5	AT6	AT7	AT8	AT9	AT10	AT11	AT12	AT13	AT14	AT15	AT16	AT17	AT18	AT19	AT20
4R4001	REG	SOIL	CORE		6/03-6/03	CFA-04	SURFACE SPLE	1	0-0.5																				
4R4002	REG	SOIL	CORE		6/03-6/03	CFA-04	SURFACE SPLE	2	0-0.5																				
4R4003	REG	SOIL	CORE		6/03-6/03	CFA-04	SURFACE SPLE	3	0-0.5																				
4R4004	REG	SOIL	CORE		6/03-6/03	CFA-04	SURFACE SPLE	4	0-0.5																				
4R4005	REG	SOIL	DUP		6/03-6/03	CFA-04	SURFACE SPLE	5	0-0.5																				
4R4006	REG	SOIL	CORE		6/03-6/03	CFA-04	SURFACE SPLE	6	0-0.5																				
4R4007	REG	SOIL	CORE		6/03-6/03	CFA-04	SURFACE SPLE	7	0-0.5																				
4R4008	REG	SOIL	CORE		6/03-6/03	CFA-04	SURFACE SPLE	8	0-0.5																				
4R4009	REG	SOIL	CORE		6/03-6/03	CFA-04	SURFACE SPLE	9	0-0.5																				
4R4010	REG	SOIL	CORE		6/03-6/03	CFA-04	SURFACE SPLE	10	0-0.5																				
4R4011	REG	SOIL	CORE		6/03-6/03	CFA-04	SURFACE SPLE	11	0-0.5																				
4R4012	REG	SOIL	CORE		6/03-6/03	CFA-04	SURFACE SPLE	12	0-0.5																				
4R4013	REG	SOIL	CORE		6/03-6/03	CFA-04	SURFACE SPLE	13	0-0.5																				
4R4014	REG	SOIL	CORE		6/03-6/03	CFA-04	SURFACE SPLE	14	0-0.5																				
4R4015	REG	SOIL	CORE		6/03-6/03	CFA-04	SURFACE SPLE	15	0-0.5																				
4R4016	REG	SOIL	CORE		6/03-6/03	CFA-04	SURFACE SPLE	16	0-0.5																				
4R4017	REG	SOIL	CORE		6/03-6/03	CFA-04	SURFACE SPLE	17	0-0.5																				

The sampling activity displayed on this table represents the first six characters of the sample identification number.

The complete sample identification number (10 characters) will appear on field guidance forms and sample labels.

AT1: Gamma Spec	AT11:	Comments:
AT2: Gross Alpha/Beta	AT12:	Solid Media = Calcrete
AT3: Mercury	AT13:	
AT4: Sr-90	AT14:	TCLP Metals (Soil Samples) = Mercury, Chromium, and Silver
AT5: TCLP Metals	AT15:	TCLP Metals (Calcrete Samples) = TCLP TAL
AT6: U-235	AT16:	
AT7:	AT17:	
AT8:	AT18:	
AT9:	AT19:	
AT10:	AT20:	
Analysis Suites	Contingencies	

Plan Table Number: CFA-BH-HGPOND

SAP Number: D010D-11024

Date: 12/29/2002

Plan Table Revision: 0.0

Project: CFA-04 MERCURY POND

Project Manager: WAGNER, D. W.

Sampler: Lopez, L. A.
SNO Contact: KIRCHNER, D. R.

DRAFT

Sample Description					Sample Location				Enter Analysis Types (AT) and Quantity Requested																				
Sampling Activity	Sample Type	Sample Media	Core Type	Sampling Method	Planned Date	Area	Type of Location	Location	Depth (ft)	AT1	AT2	AT3	AT4	AT5	AT6	AT7	AT8	AT9	AT10	AT11	AT12	AT13	AT14	AT15	AT16	AT17	AT18	AT19	AT20
4R4018	REG	SOIL	CORE		6/03-8/03	CFA-04	SURFACE SPLE	18	0-0.5			1																	
4R4019	REG	SOIL	CORE		6/03-8/03	CFA-04	SURFACE SPLE	19	0-0.5			1																	
4R4020	REG	SOIL	CORE		6/03-8/03	CFA-04	SURFACE SPLE	20	0-0.5			1																	
4R4021	REG	SOIL	CORE		6/03-8/03	CFA-04	SURFACE SPLE	21	0-0.5			1																	
4R4022	REG	SOIL	CORE		6/03-8/03	CFA-04	SURFACE SPLE	22	0-0.5			1																	
4R4023	REG/CCC	SOIL	DUP		6/03-8/03	CFA-04	SURFACE SPLE	23	0-0.5			2																	
4R4024	REG	SOIL	CORE		6/03-8/03	CFA-04	SURFACE SPLE	24	0-0.5			1																	
4R4025	REG	SOIL	CORE		6/03-8/03	CFA-04	SURFACE SPLE	25	0-0.5			1																	
4R4026	REG	SOIL	CORE		6/03-8/03	CFA-04	SURFACE SPLE	26	0-0.5			1																	
4R4027	REG	SOIL	CORE		6/03-8/03	CFA-04	SURFACE SPLE	27	0-0.5			1																	
4R4028	REG	SOIL	CORE		6/03-8/03	CFA-04	SURFACE SPLE	28	0-0.5			1																	
4R4029	REG	SOIL	CORE		6/03-8/03	CFA-04	SURFACE SPLE	29	0-0.5			1																	
4R4030	REG	SOIL	CORE		6/03-8/03	CFA-04	SURFACE SPLE	30	0-0.5			1																	
4R4031	REG	SOIL	CORE		6/03-8/03	CFA-04	SURFACE SPLE	31	0-0.5			1																	
4R4032	REG	SOIL	CORE		6/03-8/03	CFA-04	SURFACE SPLE	32	0-0.5			1																	
4R4033	REG	SOIL	CORE		6/03-8/03	CFA-04	SURFACE SPLE	33	0-0.5			1																	
4R4034	REG	SOIL	CORE		6/03-8/03	CFA-04	SURFACE SPLE	34	0-0.5			1																	

The sampling activity displayed on this table represents the first six characters of the sample identification number.

The complete sample identification number (10 characters) will appear on field guidance forms and sample labels.

AT1: Gamma Spec	AT11	Comments:
AT2: Gross Alpha/Beta	AT12	Solid Matrix = Calcine
AT3: Mercury	AT13	
AT4: Si-%	AT14	TCLP Metals (Solid Samples) = Mercury, Chromium, and Silver
AT5: TCLP Metals	AT15	TCLP Metals (Calcine Sample) = TCLP TAL
AT6: U-130	AT16	
AT7:	AT17	
AT8:	AT18	
AT9:	AT19	
AT10:	AT20	
Analysis Subes:		Contingencies:

DRAFT

Plan Table Number: CFA-04-HGSCMD

SAP Number: DOEAD-11024

Date: 12/20/2002

Plan Table Revision: 0.0

Project: CFA-04-MERCURY POND

Project Manager: WAGNER, D. W.

Sampler: Lopez, L. A.

SNO Contact: KIRCHNER, D. R.

Sample Description					Sample Location					Enter Analysis Types (AT) and Quantity Requested																			
Sampling Activity	Sample Type	Sample Matrix	Soil Type	Sampling Method	Planned Date	Area	Type of Location	Location	Depth (ft)	AT1	AT2	AT3	AT4	AT5	AT6	AT7	AT8	AT9	AT10	AT11	AT12	AT13	AT14	AT15	AT16	AT17	AT18	AT19	AT20
4R4035	REG	SOIL	CORE		6/03-8/03	CFA-04	SURFACE SPLE	35	0-0.5																				
4R4036	REG	SOIL	CORE		6/03-8/03	CFA-04	SURFACE SPLE	35	0-0.5																				
4R4037	REG	SOIL	CORE		6/03-8/03	CFA-04	SURFACE SPLE	37	0-0.5																				
4R4038	REG	SOIL	CORE		6/03-8/03	CFA-04	SURFACE SPLE	38	0-0.5																				
4R4039	REG	SOIL	CORE		6/03-8/03	CFA-04	SURFACE SPLE	39	0-0.5																				
4R4040	REG	SOIL	CORE		6/03-8/03	CFA-04	SURFACE SPLE	40	0-0.5																				
4R4041	REG/QDC	SOIL	DUP		6/03-8/03	CFA-04	SURFACE SPLE	41	0-0.5																				
4R4042	REG	SOIL	CORE		6/03-8/03	CFA-04	SURFACE SPLE	42	0-0.5																				
4R4043	REG	SOIL	CORE		6/03-8/03	CFA-04	SURFACE SPLE	43	0-0.5																				
4R4044	REG	SOIL	CORE		6/03-8/03	CFA-04	SURFACE SPLE	44	0-0.5																				
4R4045	REG	SOIL	CORE		6/03-8/03	CFA-04	SURFACE SPLE	45	0-0.5																				
4R4046	REG	SOIL	CORE		6/03-8/03	CFA-04	SURFACE SPLE	46	0-0.5																				
4R4047	REG	SOIL	CORE		6/03-8/03	CFA-04	SURFACE SPLE	47	0-0.5																				
4R4048	REG	SOIL	CORE		6/03-8/03	CFA-04	SURFACE SPLE	48	0-0.5																				
4R4049	REG	SOIL	CORE		6/03-8/03	CFA-04	SURFACE SPLE	49	0-0.5																				
4R4050	REG	SOIL	CORE		6/03-8/03	CFA-04	SURFACE SPLE	50	0-0.5																				
4R4051	REG/QDC	SOIL	DUP		6/03-8/03	CFA-04	DEPTH 1	ZONE 2A	0-0.5	2			2		2		2												

The sampling activity displayed on this table represents the first six characters of the sample identification number.

The complete sample identification number (10 characters) will appear on field guidance forms and sample labels.

AT1: Gamma Spec	AT11: Solid Matrix = Calcine
AT2: Gross Alpha/Beta	Comments:
AT3: Mercury	
AT4: Sr-90	TCLP Metals (Soil Samples) = Mercury, Chromium, and Silver
AT5: TCLP Metals	TCLP Metals (Calcine Sample) = TCLP TAL
AT6: U-iso	
AT7:	
AT8:	
AT9:	
AT10:	

Analysis Suite:

Contingencies:

Plan Table Number: CFA-04-HGFOND

SAP Number: U0E00-11024

Date: 12/20/2002

Plan Table Revision: 0.0

Project: CFA-04 MERCURY POND

DRAFT

Project Manager: WAGNER, D. W.

Sampler: Lopez, L. A.

SMO Contact: KIRCHNER, D. R.

Sample Description					Sample Location					Enter Analysis Types (AT) and Quantity Requested																			
Sampling Activity	Sample Type	Sample Matrix	Coll. Type	Sampling Method	Planned Date	Area	Type of Location	Location	Depth (ft)	AT1	AT2	AT3	AT4	AT5	AT6	AT7	AT8	AT9	AT10	AT11	AT12	AT13	AT14	AT15	AT16	AT17	AT18	AT19	AT20
4R4052	REG	SOIL	CORE		6/03/803	CFA-04	DEPTH 2	ZONE 2A	0.5-1	1	1	1	1	1															
4R4053	REG	SOIL	CORE		6/03/803	CFA-04	DEPTH 3	ZONE 2A	1-1.5	1	1	1	1	1															
4R4054	REG	SOIL	CORE		6/03/803	CFA-04	DEPTH 4	ZONE 2A	1.5-2	1	1	1	1	1															
4R4055	REG	SOLID	COMP		6/03/803	CFA-04	CALCINE WASTE	BOTTLES	NA	1	1	1	1	1															
4R4056	QC	WATER	RNST		6/03/803	CFA-04	QC	EQUIPMENT RINSTE	NA	1	1	1	1	1															
4R4057	QC	WATER	RNST		6/03/803	CFA-04	QC	EQUIPMENT RINSTE	NA																				
4R4058	QC	WATER	RNST		6/03/803	CFA-04	QC	EQUIPMENT RINSTE	NA																				
4R4059	QC	WATER	FDLK		6/03/003	CFA-04	QC	FIELD BLANK	NA	1			1	1															

The sampling activity displayed on this table represents the first six characters of the sample identification number.

AT1: Gamma Spec

AT2: Gross AlphaBeta

AT3: Mercury

AT4: Sr-90

AT5: TCLP Metals

AT6: U lead

AT7:

AT8:

AT9:

AT10:

Analysis Suites:

The complete sample identification number (10 characters) will appear on field guidance forms and sample labels.

AT11:

AT12:

AT13:

AT14:

AT15:

AT16:

AT17:

AT18:

AT19:

AT20:

Analysis Suites:

Contingency:

Comments

Solid Matrix = Calcine

TCLP Metals (Soil Samples) = Mercury, Chromium, and Silver

TCLP Metals (Calcine Sample) = TCLP TAL